Chapter 2
Description of the EWA Proposed Action

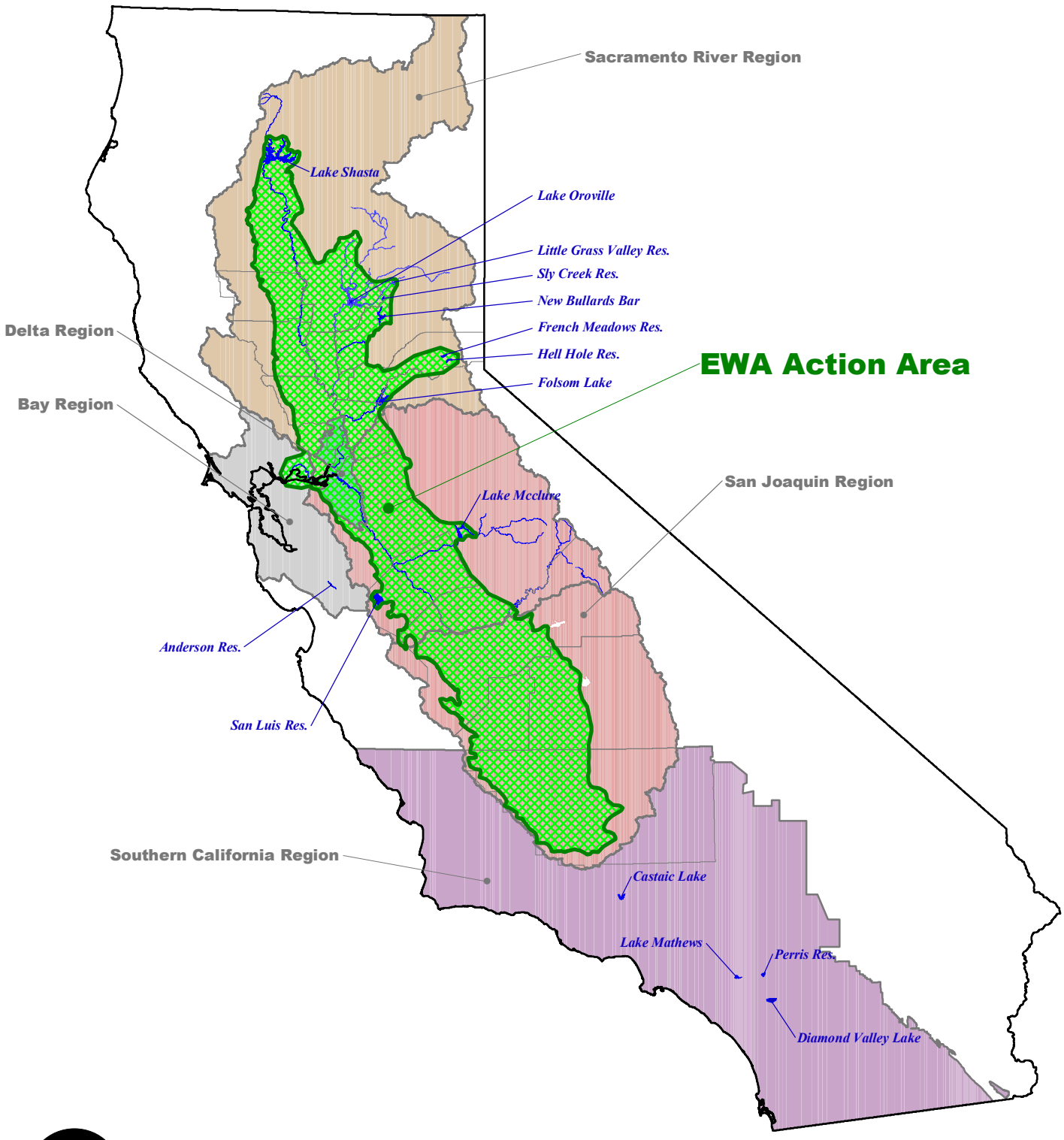
2.1 EWA Action Area

The EWA Action Area encompasses a portion of the overall CALFED Study Area (See Figure 2-1). The Action Area for the EWA ASIP includes all areas affected directly or indirectly by EWA water asset acquisition, storage, conveyance, transfer, or release activities performed to support fish actions (as described later in this Chapter). This includes the majority of the Sacramento and San Joaquin Valleys, south San Francisco Bay area (Santa Clara County), the south central California coast, and southern California service area. No new facilities would be constructed and no existing facilities would be altered for the management of EWA water assets. EWA agencies would use existing facilities of the CVP, SWP, and non-Project entities to manage the assets.

For purposes of effects analysis in the EWA ASIP, the EWA Action Area has been divided into three primary regions and sub-regions based on the types of actions proposed in each region. The three regions are Upstream from the Delta, the Delta, and the Export Service Area. The sub-regions of the Export Service Area include the northern San Joaquin Valley, the Tulare Basin in southern San Joaquin Valley, and southern California.

The Upstream from the Delta region addresses the Sacramento River from Lake Shasta to the Delta and the San Joaquin River from its confluence with the Merced River to the Delta. On-stream reservoirs included in the analyses include Lake Shasta (CVP), Lake Oroville (SWP), and Folsom Lake (CVP), and the non-project reservoirs of New Bullards Bar, Little Grass Valley, Sly Creek, Hell Hole, French Meadows, and Lake McClure. The Upstream from the Delta Region also includes the lower stretches of the Feather, Yuba, American, and Merced Rivers below their respective reservoirs (see Figure 2-1). The Upstream from the Delta region also addresses agricultural land where water could be acquired from crop idling and groundwater substitution actions.

The Delta Region includes the confluence of the Sacramento and San Joaquin rivers, the Bay-Delta, and the outflow of the Delta into the tidally influenced Suisun Bay. The Delta region incorporates a complex array of water channels, sloughs, islands, and diked farmland. SWP/CVP facilities in the Delta used to pump water to the Export Service Area and the Project modifications that change Delta flow patterns are included in the Delta Region. It is from the Delta Region that EWA assets would be pumped to the Export Service Area. There would be no other EWA actions in the Delta involving acquiring or storing EWA assets.



No Scale

Figure 2-1
EWA Action Area

The Export Service Area Region includes the water conveyance systems of the CVP and SWP and several off-stream reservoirs. San Luis Reservoir is used to store Project water and EWA assets in the northwest San Joaquin Valley; Anderson Reservoir in the Santa Clara Valley for source shifting; while Castaic Lake, Diamond Valley, Lake Perris, Lake Mathew would be used for management of EWA assets and for source shifting actions in southern California. The San Joaquin Valley Region would also be used for acquiring and managing EWA assets via groundwater purchase and storage and from crop idling.

The species inhabiting each of the regions, rivers, and reservoirs, and their relationship to the regional setting are described in Chapter 3. Descriptions of the NCCP habitats and their relationships to each regional setting are presented in Chapter 5.

2.2 EWA Program Overview

The EWA is a cooperative management program, the purpose of which is to provide protection to at-risk native fish species of the Bay-Delta estuary through environmentally beneficial changes in SWP/CVP operations at no uncompensated water cost to the Projects' water users. This approach to fish protection involves changing Project operations to benefit fish and the acquisition of alternative sources of project water supply, called the "EWA assets," which the EWA agencies use to replace the regular project water supply lost by pumping reductions. The following EWA program overview is excerpted from the CALFED PEIS/EIR Record of Decision (CALFED ROD).

The EWA program consists of two primary elements: implementing fish actions that protect at-risk native fish species (see Section 2.4.2) and increasing water supply reliability by acquiring and managing assets to compensate for the supply effects of these actions (see Section 2.4.3). Actions that protect fish species include reduction of pumping at the Delta SWP and CVP export pumping plants. Project export pumping varies by season and hydrologic year and can adversely affect fish at times when fish are near the pumps or moving through the Delta. Pumping reductions can reduce water supply reliability for the SWP and CVP Export Service Areas, causing conflicts between fishery and water supply interests. A key feature of the EWA is use of water assets to replace supplies that are interrupted during pumping reductions. The EWA assets can also provide other benefits such as augmenting instream flows and Delta outflows.

The CALFED agencies established an EWA to provide water for the protection and recovery of fish beyond that which would be available through the existing baseline of regulatory protection related to project operations. The EWA involves neither new sources of water nor new construction.

The CVP and SWP export project water through the Delta pumps. This pumping can change internal flow patterns within the Delta, and entrain and kill fish at the intakes to the SWP and CVP pumping facilities. The EWA agencies take actions to protect and restore fish in the Delta and to provide additional benefits upstream. Actions in the

Delta to protect fish can involve temporary pumping reductions in the Delta or closure of the Delta Cross Channel gates. Closing the Delta Cross Channel improves the survival of anadromous fish migrating downstream on the Sacramento River because it blocks a route to the central Delta where survival is poor and helps fish migrate out to the Bay. Management agency biologists use real-time data on fish abundance and distribution, flow, and fish salvage at the Delta export pumps to develop recommendations for fishprotection. Actions providing secondary benefits include increasing instream flows in rivers upstream from the Delta or augmenting Delta outflows.

The EWA seeks to benefit ESA native fish species that spend some portion of their life cycle in the Delta. The fish species of concern, their life stages, and location in the Delta are described in Chapter 3.

2.3 Baseline Level of Fishery Protection

This section presents the existing environmental regulation, biological opinions, and SWP/CVP operational parameters currently being implemented to protect at-risk native fish species in the Delta. These items all represent the "baseline level of fishery protection" that the EWA program builds upon in addressing the EWA goal of providing protection to the fish of the Bay-Delta estuary through environmentally beneficial changes in SWP/CVP operations at no uncompensated water cost to the Projects' water users.

2.3.1 Overview

The CALFED ROD identified a baseline level of fishery protection requirements for SWP/CVP Project operations. Existing regulatory programs established these requirements prior to implementation of the CALFED ROD. These requirements alter Project operations in ways that improve Delta water conditions for fish. The baseline level of fishery protection includes the environmental requirements identified below, updated to include the September 2002 BO on Spring-run Chinook and Steelhead.

- **1993 Winter-run Biological Opinion (NOAA Fisheries).** In 1993, the National Marine Fisheries Service (NOAA Fisheries) assessed the potential effects of operation of the CVP and SWP on the Federally-listed winter-run Chinook salmon. Based on this assessment, NOAA Fisheries issued a biological opinion concluding that operation of the CVP would likely jeopardize the continued existence of winter-run chinook salmon. Reasonable and prudent alternatives to CVP operations were developed to avoid jeopardy, including specific flow, temperature, reservoir storage, and diversion requirements in the Sacramento River and in the Delta. NOAA Fisheries reinitiated consultation on CVP and SWP operations when the "Principles for Agreement" that formed the basis for the Bay-Delta Plan were originally signed. NOAA Fisheries subsequently issued a revised biological opinion in 1995. Reclamation and DWR currently operate the CVP and SWP, respectively, in accordance with the NOAA Fisheries 1995 Winter-run Chinook Salmon Biological Opinion.

- **1995 Delta Water Quality Control Plan (1995 Delta WQCP) and SWRCB's Decision 1641.** The SWP and CVP met the flow-related objectives of this plan at the time the CALFED ROD was signed. The SWRCB has subsequently issued Decision 1641 (D-1641), which provided an interim decision regarding the obligations of the SWP and CVP to meet the flow-related objectives in the Water Quality Control Plan (SWRCB 1995).

- **Vernalis Adaptive Management Plan (VAMP).** The Vernalis Adaptive Management Plan (VAMP) is a science-based, adaptive management plan designed to determine and protect the survival and transport of salmon smolts through the Delta in relation to the flow of the San Joaquin River, SWP/CVP exports, and the operation of a fish barrier at the head of Old River. This study calls for a regulated pulse flow level at Vernalis and a predetermined SWP/CVP export rate for a 31-day period during April and May. Table 2-1 shows the allowable export rates as a function of the flow at Vernalis. The San Joaquin River Agreement stipulates the target flow rate of the San Joaquin River and the water suppliers during this period, based on the San Joaquin Valley Water Year Hydrologic Classification (index of water supply availability and wetness). VAMP was included in D-1641, a water rights decision that implemented the 1995 Delta WQCP. As part of the baseline level of fisheries protection, Reclamation would use CVPIA (b)(2) water to account for export reductions due to the limited pumping during April and May. CVPIA (b)(2) water has been used to account for decreased SWP exports in the past; the SWP would be unlikely to participate in VAMP as part of the baseline level of fisheries protection without a method to repay the SWP contractors for export losses.

Table 2-1
VAMP Export Limitations

Export Rates	***Vernalis Flow Rate (cfs)***			
(cfs)	***7,000***	***5,700***	***4,450***	***3,200***
1,500	X		X	X
2,250		X		
3,000	X			

- **1995 Delta Smelt Biological Opinion.** On March 6, 1995, the US Fish and Wildlife Service (USFWS) issued a biological opinion on the effects of the long-term operation of the CVP and SWP on the Federally listed, threatened Delta smelt and its critical habitat (USFWS 1995). The biological opinion concluded that CVP and SWP operations, as proposed,[1] are not likely to jeopardize the continued existence of the Delta smelt or result in the destruction or adverse modification of proposed critical habitat for the Delta smelt. To promote recovery of the species and to ensure that project operations would not interfere with the survival and recovery of the species, USFWS issued a number of recommendations relating to (1) incidental take

[1] Operations "as proposed" included provisions from prior biological opinions, water quality standards, and the implementation of the Recovery Plan, which were expected to result in improved habitat.

at various locations in the Delta; (2) fish salvage; (3) monitoring of Delta parameters such as X_2 and outflow; and (4) conservation of the species. The CVP and SWP currently operate in accordance with the USFWS 1995 Delta Smelt Biological Opinion.

The 1995 Delta Smelt Biological Opinion contains an export pump reduction (item 2 on page 19 of the opinion), commonly referred to as the "2 to 1 Vernalis flow/export ratio." This pump reduction objective calls for the SWP and CVP to reduce combined exports, below that allowed in the 1995 Delta WQCP, during a 31-day period in April and May. The 1995 Delta WQCP allows exports to be 100 percent of the base flow at Vernalis[2] during the April-May pulse period, when additional water is released to simulate historic snowmelt flows for fish. The 1995 Delta smelt opinion reduces exports even further, so that exports can only be 50 percent of the base flow at Vernalis. CVPIA 3406(b)(2) water would be used to account for this decrease and this water is part of the baseline fishery protection. Multiple interpretations of this requirement led to conflict between the SWP and USFWS, and the SWP would be unlikely to meet this requirement under the baseline level of fisheries protection without compensation for water supply loss.

- **2002 Spring-run Chinook and Steelhead Biological Opinion.** On September 20, 2002, NOAA Fisheries issued a biological opinion on CVP and SWP Operations, April 1, 2002, through March 31, 2004, on Federally listed threatened Central Valley spring-run Chinook salmon and threatened Central Valley steelhead (NMFS 2002). The Biological Opinion established non-discretionary terms and conditions that are intended to minimize the adverse effects of flow fluctuations associated with upstream reservoir operations on the incubating eggs, fry and juvenile steelhead, and spring-run Chinook salmon. These terms and conditions pertain to flow and water temperature requirements, ramping criteria, flow fluctuations, and incidental take/fish salvage of the species.

- **Full Use of 800 TAF Supply of Water Pursuant to Section 3406(b)(2) of the CVPIA**. At the August 2000 signing of the CALFED ROD, the decision by the Department of the Interior regarding the use of (b)(2) water included "reset" and "offset,"[3] provisions that were further clarified in the CALFED ROD. The 2002 Federal District Court decision, however, determined that (b)(2) implementation should not include these reset and offset provisions. The Ninth District Court upheld the District Court's ruling on offset and reset. The baseline level of fisheries protection includes the dedication and management of the 800,000 acre-feet using a policy that reflects the opinion of the court.

- **Level 2[4] Refuge Water Supplies.** Section 3406(d) of the CVPIA authorizes and directs the Secretary of the Interior to provide firm water supplies of suitable

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2 Vernalis is a town on the San Joaquin River just downstream from the confluence with the Stanislaus River where San Joaquin River flow and water quality are measured.

3 "Reset" and "offset" are defined on Page 56 of the CALFED ROD (CALFED 2000b).

4 The USBR Report on Refuge Water Supply Investigations (March 1989) defined four levels of refuge water supplies: existing firm water supply (Level 1), current average annual water deliveries (Level 2), full use of existing development (Level 3), and to permit full habitat development (Level 4).

quality to certain national wildlife refuges in the Central Valley of California, certain State of California wildlife management areas, and the Grassland Resource Conservation District (collectively referred to below as "refuges") in accordance with the 1989 *Report on Refuge Water Supply Investigations and the 1989 San Joaquin Basin Action Plan/Kesterson Mitigation Plan* (USFWS and USBR 2002). Level 2 supplies are defined in the Investigations Report as the historic annual average water deliveries to each refuge prior to enactment of the CVPIA and two-thirds of the water supplies identified for the Action Plan Lands (USFWS and USBR 2002). These firm water supplies must be provided at the refuge boundaries, as required by the CVPIA. To the extent available, the CVP would use its share of the benefits from Joint Point of Diversion (as explained in Section 2.4.3.2.2) to comply with its Level 2 refuge water supply mandates, but using such benefits would not create any limitation on the overall Level 2 supply that is available for refuges.

To implement these fish protection requirements, Management and Project agencies could take several actions described in the sections below.

2.3.2 Delta Export Pumping Reductions

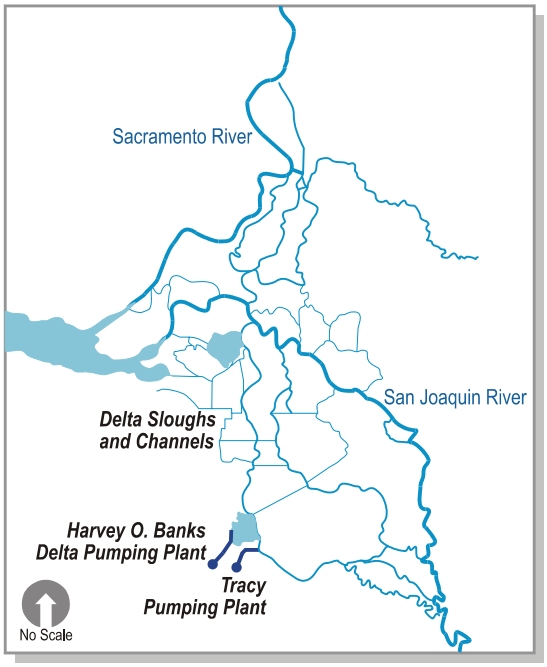

Figure 2-2
Location of Delta Export Pumps

On going pumping water through the Tracy and Banks pumping plants (see Figure 2-2) alters Delta hydrodynamics, changing conditions for fish rearing and migration. Fish mortality at the pumps can result directly from entrainment[5] through fish screens, impingement,[6] losses to predators, and handling of captured fish in the salvage process. The operation of the pumping plants may also have indirect effects on fish. Altered net flow patterns sometimes changes migratory patterns and increases the likelihood of predation. Pumping reductions help to reduce these effects on Delta hydrodynamics and reduce entrainment of fish at the pumping facilities.

Under the baseline level of fishery protection, Project Agencies would implement pumping reductions when the fish protection requirements mandated the

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CVPIA Section 3406(d) committed to providing firm water through long-term contractual agreements for Level 2 water supply.

5 "Entrainment" occurs when fish are drawn into the pumps, which can injure fish or place them into unsuitable habitat. (Reclamation 2003).

6 "Impingement" occurs when fish are trapped against the outer surface of a fish screen. (Environmental Protection Agency 2001)

reduction. The biological opinions result in pump reductions when fish take at the pumps reached the "reconsultation level" established in the applicable opinion.[7] Table 2-2 shows the times that these protections are likely to require pump reductions and the reasons that reductions help fish.

Table 2-2
Pump Reductions Under the Existing Baseline Level of Fisheries Protection

Timeframe	*Benefiting Fish*[8]	*Reason*	*Regulatory Mechanism*
December – January	Juvenile salmonids	Protect outmigrating juvenile salmonids	Biological opinion
	Adult smelt[9]	Protect upmigrating adult smelt	Biological opinion
February – March	Juvenile salmonids	Protect outmigrating juvenile salmonids	Biological opinion
	Adult smelt	Protect upmigrating adult smelt	Biological opinion
April – May 31 days	Salmon smolts	Determine how export pumping affects survival and passage of salmon smolts through the Delta	D-1641 (VAMP) (SWP may not follow if it were not reimbursed)
June	Juvenile smelt	Protect juvenile smelt near the pumps	Biological opinion

Under the baseline level of fisheries protection, the CVP and SWP would attempt to recover the water from reduced pumping through a variety of actions. The CVP would use (b)(2) water to account for the pumping reductions required in the Delta for biological and water quality control purposes within the 800,000 acre-foot upper limit. Both the SWP and CVP use operational flexibility to recover additional water. These sources are not likely to be sufficient to compensate for all pumping reductions.

2.3.3 Delta Cross Channel Gates Closure

The Delta Cross Channel (DCC), near the town of Walnut Grove, diverts Sacramento River water eastward to the Mokelumne River system where it more directly affects flows across the central Delta to the Project pumps (Figure 2-3). Movement of water in a southerly direction through the Delta is not a natural hydrological process and can confuse migrating salmon that are attempting to follow stream flows. Avoiding this effect is particularly important during the winter, when the winter-run Chinook salmon, a Federal- and State-listed endangered species, is migrating upstream to spawn. (The late fall-runs are also migrating at this time, classified as candidate species.) DCC gate closure during the winter also helps the chance that emigrating

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7 The biological opinions establish levels that define responses to fish mortality: "warning level" indicates that caution should be used, "reconsultation level" indicates that the action leading to fish mortality triggers reinitiation of consultation, and "jeopardy" indicates that the action could place the continued existence of the fish species in jeopardy.

8 "Benefiting Fish" only include the fish that require pumping reductions through a regulatory mechanism. Incidental benefits to other fish would also result from some reductions.

9 Effects on adult delta smelt at the pumps have not yet exceeded allowable take limits specified in the 1995 biological opinion, but the effects could trigger a reduction at the pumps.

spring-run and winter-run chinook salmon and steelhead smolts, might travel through the central Delta and swim toward the pumps instead of taking their natural route to the Bay.

Closing the DCC gates ensures that juvenile spring-run and winter-run chinook salmon and steelhead smolts remain in the mainstem Sacramento River, improving their likelihood of successful outmigration through the western Delta and San Francisco Bay. The closure also reduces the direct flow of Sacramento River to the export pumps, which can reduce the quality of water being exported to project users. With the DCC closed, for the same exports, more comes from the western Delta, which is closer to the Bay and has lower water quality. The Project Agencies may reduce export pumping in response to the changes in flow direction.

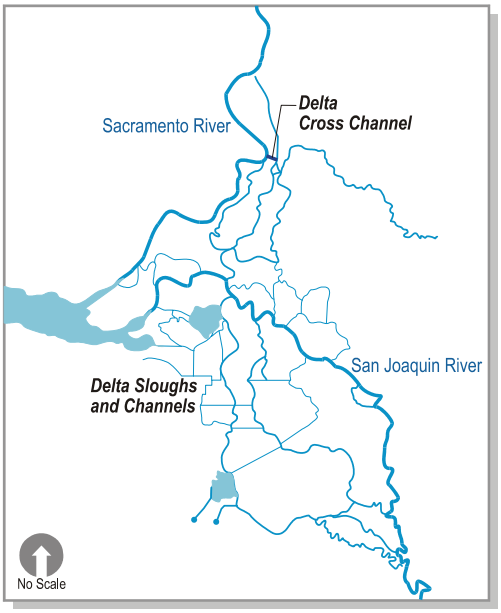

Figure 2-3
Location of Delta Cross Channel

The regulatory baseline for fishery protection dictates DCC gate closures as follows:

1) USBR standing operating procedures call for gate closure when flow on the Sacramento River reaches 20,000 to 25,000 cfs.

2) State Water Resources Control Board Decision 1641 allows for the following operations of the DCC gates:

   – From November 1 through January 31 the gates would be closed for up to 45 days as requested by FWS, NOAA Fisheries, and DFG. These closures are determined as follows:

     • If the Knight's Landing catch index (KLCI) is > 5 and ≤ 10 salmon, the DCC gates would be closed for 4 days within 24 hours. If after 4 days the KLCI still exceeds 5, the gates would remain closed for another 4 days.

     • If the KLCI is > 10 salmon, the DCC gates are to be closed until the KLCI is ≤ 5.

   – The gates would be closed continuously from February 1 through May 20.

   – From May 21 through June 15 the gates would be closed for a total of 14 days, again as requested by USFWS, NOAA Fisheries, and CDFG.

2.3.4 Increasing Instream Flows

Increasing flows year-round in upstream river reaches improves habitat conditions for anadromous and resident fish populations. Reclamation and USFWS use CVPIA (b)(2) supplies within the 800,000 acre-foot upper limit to meet these objectives;

therefore, the water is used to increase flows on CVP-controlled streams, such as the Sacramento, American, and Stanislaus Rivers and Clear Creek. The improved flows:

- Provide improved spawning and rearing habitat for salmon and steelhead;
- Improve survival of downstream migrating chinook salmon smolts;
- Improve habitat conditions for white sturgeon, green sturgeon, American shad, and striped bass to migrate upstream, spawn, and allow progeny to survive;
- Aid in the downstream transport of striped bass eggs and larvae;
- Improve water temperatures and increase habitat for rearing juvenile steelhead; and
- Benefit Delta smelt and other estuarine species.

The rationale and scientific basis for the improved flows are found in a variety of sources (including the Anadromous Fish Restoration Program[10] documents, published literature, CDFG reports, and other restoration programs) and are generally based on results of instream flow and temperature studies conducted by the FWS, CDFG, or others, as well as relationships between flow and adult fish returns, correlation analyses, and other life-history information.

The flow objectives for each stream are generally consistent with the Anadromous Fish Restoration Program's January 2001 Final Restoration Plan (AFRP Plan). These flow objectives would be higher than current minimum flow requirements in each stream. The targeted flow objectives are based on thresholds of CVP reservoir storage and forecasted inflow and the amount of (b)(2) water available to meet the objectives. Fisheries and hydrologic monitoring trigger higher flow releases. In general, spawning flows are initiated in October or November when adult salmon are observed in the streams and river temperatures are 60 degrees or less.

2.3.5 Augmenting Delta Outflows

Water from the Delta flows to the San Francisco Bay, which is more saline than the Delta estuary. The water mixes in the Suisun Bay area, and the mixing zone location varies depending on the Delta outflow. Higher amounts of Delta outflow push the saltwater mixing zone farther out to the Bay, and lower flows allow the saltwater zone to move farther into the Delta. The baseline level of fisheries protection includes actions related to Delta outflow required by the SWRCB's Decision 1641.

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[10] The U.S. Department of the Interior established the Anadromous Fish Restoration Program to satisfy Section 3406 (b)(1) of the CVPIA: "develop within three years of enactment and implement a program which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in Central Valley rivers and streams would be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991..."

2.3.6 Non-Flow Related Actions

In the absence of the EWA, a number of ongoing projects and programs are expected to continue, the purpose of which is to improve the condition of species and habitats. Under the CVPIA, funding was dedicated to projects in 2002 that would be designed and implemented during the EWA timeframe. Under the CALFED Ecological Restoration Program (ERP), funding was dedicated to projects in 2002 that would be designed and implemented during the EWA timeframe. These activities are considered a part of the baseline level of fisheries protection because their purpose is for fish protection and environmental protection and because they may create beneficial and/or adverse effects during the EWA timeframe on similar resources, in the absence of the EWA.

2.3.7 Water Management

Under the CALFED baseline for fisheries protection, it was reasonably predicted that pumping reductions for biological opinions result in reduced CVP and SWP exports. The CVP and SWP use operational flexibility within the Delta to try to make up for the water deliveries lost during pump reductions. If the Projects do not access enough water, they reduce their deliveries to water users. The water users then implement actions to reduce or address their shortages. The actions taken by the CVP and SWP are described below.

2.3.7.1 Delta Operational Flexibility

Under the baseline for fisheries protection, the Projects access water from flexible operations of the Delta export facilities. These types of flexible operations were defined prior to the EWA and are available for the Projects to help replace their users for pump reductions. Only the third item, relaxing the export/inflow ratio, provide additional water for the Projects. The other two options provide additional capacity for the Projects to move water through the Delta, but they do not provide additional water to reimburse water users for lost water. Under the baseline for fisheries protection, these actions are unlikely to provide enough water or capacity to replace the water lost during fish actions. The sections below describe the available options to increase water and capacity.

2.3.7.1.1 Joint Point of Diversion

The Joint Point of Diversion, established by D-1641,[11] allows the SWP and CVP to pump water for each other during times of restriction for one set of pumps. D-1641 established a staged implementation, in which the Projects would gradually begin to use facilities jointly.

- **Stage 1:** the CVP can use Banks Pumping Plant to divert water for selected CVP contractors, and either Project could use the others' facilities to recover export reductions to protect fish if the Projects complete a Water Level Response Plan that outlines the responses to changing water levels in the south Delta.

[11] Water rights Decision 1641 is explained in more detail in Chapter 1.

- **Stage 2:** the Projects can divert water from either pumping plant for any of their permitted purposes up to permitted capacity. The Projects must submit an operations plan to protect fish and wildlife and other legal users of water.

- **Stage 3:** the Projects can divert water from either pumping plant up to the physical plant capacity if they completed an operations plan to protect aquatic resources and their habitat and protect other legal users of water and if they implement water barriers or other water level protection.

Prior to the CALFED ROD, the Projects were in Stages 1 and 2 of the implementation process and could use Joint Point of Diversion to replace water that had been lost during pump reductions to protect fish. It is reasonably foreseeable that without the CALFED ROD, the Project Agencies would have completed the requirements to move into Stage 3 in which they could use the Joint Point of Diversion to supply water to their contractors in the Export Service Area.

Under the baseline for fisheries protection, the Joint Point of Diversion could provide additional capacity to pump water into the Export Service Area, but the Projects would need to provide the water to be pumped.

2.3.7.1.2 Relaxation of the Section 10 Constraint

The SWP is limited under Section 10 of the Rivers and Harbors Act,[12] pursuant to U.S. Army Corps of Engineers (USACE) Public Notice 5820-A, to a 3-day average rate of diversion of water into Clifton Court Forebay of 13,250 acre-feet per day, or 6,680 cfs. Between December 15 and March 15, the SWP can increase diversions above 6,680 cfs by one-third of the San Joaquin River flow at Vernalis when this flow is greater than 1,000 cfs.

The USACE granted permission to the SWP to relax the Section 10 constraint and increase the base diversion rate by the equivalent of 500 cfs to an average of 7,180 cfs for the months of July through September. The relaxation was initially permitted for summer 2000–02. Another application for relaxation in 2003 and 2004 has been submitted and is expected to be approved in 2003. Under the baseline for fisheries protection, this 500 cfs is used to replace water lost during pump reductions to benefit fish. The conveyance capacity would yield approximately 50,000 to 60,000 acre-feet per year, depending on operational restrictions.

2.3.7.1.3 Relaxation of the Export/Inflow Ratio

Under the SWRCB's D-1641 and Orders 2000-10 and 2001-5, Project exports are limited to a percentage of Delta inflow, usually 35 or 65 percent. This limitation is commonly called the Export/Inflow, or E/I, ratio, and the values throughout the year are shown in Table 2-3. D-1641 allows for these ratios to be relaxed at the discretion of

[12] Section 10 of the Rivers and Harbors Act prohibits the obstruction or alteration of navigable waters of the U.S. without a permit from the USACE. Under Section 10, the USACE regulates projects or construction of structures that could interfere with navigation. A Department of the Army permit is needed to construct any structure on any navigable water of the United States, to excavate or deposit material in such waters, or to do any work affecting the course, location, condition, or physical capacity of such waters.

the NOAA Fisheries, USFWS, and CDFG. Under the existing regulatory baseline for fishery protection, water that is diverted during periods of E/I ratio relaxation approved by the fish agencies would be used to reimburse the Projects for water lost during pump reductions to protect fish. No relaxations of the E/I standard are depicted in regulatory baseline operations modeling because they would be short-term opportunistic events.

Table 2-3
Export/Inflow Ratio

Period	*Percent of Total Delta Inflow*
October – January	65
February	35 – 45
March – June	35
July – September	65

2.3.8 Existing Regulatory Commitments

As part of the MSCS Conservation Agreement and the USFWS and the NOAA Fisheries Biological Opinions, several CALFED agencies (USFWS, Reclamation, Bureau of Land Management, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, Natural Resources Conservation Service, the Resources Agency of California, California Department of Fish and Game, and the Department of Water Resources) provided a commitment, subject to specified conditions and legal requirements, that for the first 4 years of CALFED Stage 1 Implementation (2000 to 2007), there would be no additional CVP or SWP export reductions resulting from actions to protect fish under the federal ESA, California Endangered Species Act (CESA), or Natural Community Conservation Planning Act (NCCPA) beyond exports allowed under the existing regulatory baseline of fishery protection.. This commitment was based on the conditions in Section VIII-B of the MSCS Conservation Agreement and the availability of three tiers of EWA assets:

- Tier 1 is baseline water, provided by existing regulations and existing operational flexibility. The baseline level of fishery protection consists of the biological opinions on winter-run salmon and Delta smelt, 1995 Delta Water Quality Control Plan as implemented by SWRCB Decision 1641 and Order 2001-05, and 800,000 acre-feet of CVP Yield pursuant to the Central Valley Project Improvement Act (CVPIA) Section 3406(b)(2).

- Tier 2 consists of the water assets from the EWA combined with the benefits of a fully funded Ecosystem Restoration Program (ERP) and would be an insurance mechanism that would allow water to be provided for fish when needed without reducing deliveries to water users. Tier 1 and Tier 2 would be, in effect, a water budget for the environment and would be used to avoid the need for Tier 3 assets.

- Tier 3 consists of assets beyond Tiers 1 and 2 and would be based upon the commitment and ability of the CALFED agencies to make additional water available should it be needed. It would be unlikely that assets beyond those in Tier 1 and Tier 2 would be needed to meet ESA requirements. If further assets were needed, however, the third tier would be provided in specific circumstances. To

determine the need for Tier 3 assets, the fishery agencies would consider the views of an independent science panel. Tier 3 measures would be used only when Tier 1 and Tier 2 measures are insufficient to avoid jeopardy, as determined by the USFWS or NOAA Fisheries. The USFWS and NOAA Fisheries define jeopardy as a situation in which an action is likely to jeopardize the continued existence of a species listed as endangered or threatened under the ESA. If USFWS and NFMS trigger Tier 3, measures could include increased EWA acquisitions or uncompensated fish actions.

2.4 Proposed Action (Flexible Purchase Alternative)

2.4.1 EWA Overview

The Proposed Action is based on taking adequate actions to protect fish to allow the EWA to meet the regulatory commitments in the CALFED ROD and Operating Principles Agreement. The Proposed Action would allow the EWA agencies to use water for a broad range of fish actions. These actions would include reduction of Delta export pumping, closing the Delta cross channel, augmenting Delta outflow, or increasing instream flows. The EWA agencies would have the flexibility to choose from these actions to best protect at-risk fish, and would not need to solely focus on actions within the Delta. The Proposed Action would allow the EWA agencies to respond to changes in base condition operations, such as modifications to (b)(2), and at the same time providing for anticipated levels of fish actions. The Proposed Action would be limited primarily by funding in that the EWA agencies would determine the amount of assets to acquire largely based on available funding and asset prices. The Proposed Action would have flexibility to respond to changing fish and hydrologic conditions midway through a year.

The Proposed Action would allow the EWA agencies to vary water asset purchases from those defined in the CALFED ROD to meet water needs in a specific year. The CALFED ROD identified a minimum of 185,000 acre-feet of water purchases per year, with at least 35,000 acre-feet coming from areas that are upstream from the Delta and 150,000 acre-feet from the export service areas. The Proposed Action would allow the EWA Project Agencies to purchase up to 600,000 acre-feet of water, although the EWA agencies would typically acquire 200,000 to 300,000 acre-feet except in wet years or years with high fish needs (see Section 2.4.3 for a discussion of a typical year). Water purchases under the Proposed Action would be neither fixed at 185,000 acre-feet per year nor held to specific purchase quantities upstream from the Delta or in the export service areas. The EWA agencies would use the concept of functional equivalence (as defined in Section 2.2.2.3) to combine methods, water sources, and operational flexibilities under the Proposed Action to provide a broad range of fish actions, help offset changes in levels of protection provided by (b)(2) assets or to increase the EWA in the future. Variable assets would be acquired at the same manner as specified in the EWA Operating Principles Agreement.

The Proposed Action would allow the EWA Project Agencies to acquire up to 200,000 acre-feet of storage capabilities if a reasonably priced option were available; this

EIS/EIR assesses the environmental effects of groundwater storage because it is the most likely storage option. If groundwater storage could not be implemented for financial or technical reasons, the Proposed Action would allow other actions to achieve similar objectives.

If the EWA assets were fully used but were not sufficient to prevent jeopardy, then the EWA Management Agencies would initiate Tier 3. In the Proposed Action, the EWA Management Agencies would not likely need to initiate Tier 3 frequently because the Proposed Action includes high upper limits for purchases. If Tier 3 were needed, additional acquisitions would be covered by this environmental document as long as the total assets (Tier 2 and Tier 3) were less than 600,000 acre-feet. Asset purchases above 600,000 acre-feet would require additional environmental analysis. The Proposed Action would cost more, have greater benefits for fish (supporting protection and recovery), and would likely result in a reduced frequency of initiating Tier 3 water acquisitions.

Providing flexibility to operate differently each year could help the EWA agencies address varying needs for water in different year types. Fish actions at the export pumps are dependent on the presence of the fish near the pumps, a factor that is not always dependent on the hydrologic year type. After the EWA agencies undertake a fish action, the program must repay water to the affected CVP or SWP water users. As explained previously, the EWA agencies owe the projects the amount of water that could have been pumped during the time of a pump reduction. During a typical dry year the pumps are not very active because there is less exportable water in the Delta. The Projects do not pump as much water in dry years because supplies are limited. Therefore, the level of compensation required to the Projects would be less than in below normal to wet years. In wet years, the amounts of water in the Delta allow the Project Agencies to operate the export pumps at their maximum permitted capacity. The water that would have been pumped in a wet year is much greater than in a dry year. In wet years, the EWA agencies must be able to provide more water to repay the projects than in dry years.

The next two sections (2.4.2 and 2.4.3) describe the components of the Proposed Action, including the EWA agencies' actions to protect fish and benefit the environment, and the actions to acquire and manage assets. Section 2.5 includes the environmental commitments required to mitigate any potential effects of the Proposed Action.

2.4.2 Actions to Protect Fish and Benefit the Environment

The EWA agencies have established operating tools that allow them to protect fish. These operational tools include (1) reducing export pumping, (2) closing the Delta Cross Channel gates, (3) increasing instream flows, and (4) augmenting Delta outflow. These actions were described in the baseline level of fisheries protection, Section 2.3. These actions would take place throughout the year, under various conditions. The EWA agencies would use their acquired assets, in addition to actions specified in the regulatory baseline level of fishery protection, to meet protection objectives for at-risk fish species within the Sacramento and San Joaquin Rivers and their tributaries and

the Delta. Each tool, its timing, the protection it provides, and why and how each action will be undertaken is described below. These descriptions are followed by an explanation of the process used to decide when actions should be taken.

2.4.2.1 Export Pumping Reductions

As described in the baseline level of fishery protection (Section 2.3.2), reducing export pumping can protect fish in the vicinity of the Project export pumps, and also can provide secondary benefits to fish throughout the Delta. The Management Agencies would use pump reductions from December to June, but vary them each year depending on the behavior of the fish and hydrologic conditions and water quality. The general timing of pump reductions to benefit specific fish types is the same as for the baseline level of fishery protection. The EWA agencies would not necessarily wait to reach the reconsultation level conditions identified in the Biological Opinions before calling for export reductions. For the Proposed Action, the EWA agencies would use the assets to take fish actions when they deem most appropriate.

Actual EWA pump reductions would vary each year depending on fish conditions, hydrology, available EWA assets, and other factors. The potential reductions are discussed below by time of year.

2.4.2.1.1 Export Reductions in December and January

Reducing exports in December and January during critical outmigration periods would increase survival of outmigrating salmonids from the Sacramento basin, including listed winter-run Chinook, spring-run Chinook, steelhead trout, and candidate late-fall and fall-run Chinook. Adult Delta smelt and Sacramento splittail are also migrating upstream to spawning areas at this time.

This reduction would increase the survival of juvenile Chinook salmon smolts (including winter-run presmolts and spring-run yearlings) migrating through the Delta in the winter. It is scientifically supported by several years (1993 – 2002) of mark/capture data that indicate the survival of juvenile late fall-run Chinook salmon in the central Delta decreases as exports increase. Further support for pumping reduction is based on a recent analysis that indicates that December is an important migration period for winter run pre-smolts and that the Delta Cross Channel gate closures during December appear to be correlated with low winter-run salvage at the export facilities later in the year.

Typical actions would reduce pumping to 6,000 cfs for 5 days at a time, and in some years those reductions would occur several times during these months. For example, the EWA in past years reduced pumping for 10 days total in January and used 65,000 to 70,000 acre-feet of assets. During these months, the EWA agencies usually reduce pumping in conjunction with closing the Delta Cross Channel gates.

2.4.2.1.2 Export Pumping Reductions in February and March

Reducing export pumping in the critical out-migration period in February and March would increase survival of out-migrating juvenile Chinook salmonids from the Sacramento basin, with a focus on ESA listed winter-run Chinook salmon and

steelhead trout. Adult Delta smelt and Sacramento splittail also are migrating upstream to spawning areas at this time.

This reduction would increase the survival of juvenile salmonid smolts migrating through the Delta in the late winter. Several years (1993 – 2002) of mark/recapture data indicate that the survival of juvenile late fall-run Chinook salmon in the central Delta decreases as exports increase. These export reductions would supplement the primary protective action of closing the Delta Cross Channel gates during this period. Reduced exports also decrease ESA incidental take of juvenile winter-run salmon, spawning adult Delta smelt and Sacramento splittail when the species are in the south/central Delta. Typical actions would reduce pumping to 6,000 cfs –8,000 cfs for 5-10 days at a time in February through March.

2.4.2.1.3 Export Reductions in April and May

Reducing Delta exports during April and May would help out-migrating juvenile fall-run Chinook salmon. As described in the baseline level of fisheries protection (Section 2.3.3), the VAMP program calls for specific flow releases from the Stanislaus, Tuolumne, and Merced Rivers and specific pump reductions during 31 days, generally from mid-April to mid-May. These actions would evaluate the relative effects of export and inflow to juvenile San Joaquin basin Chinook salmon survival and assist in providing protection for both anadromous and estuarine species. The CVP would use (b)(2) water to undertake the VAMP study in the baseline level of fisheries protection condition, but the SWP may not have water to contribute to the study. As part of the Proposed Action, the EWA agencies could provide water for the SWP to participate in VAMP.

The Proposed Action could also include pumping reductions before April 15 to protect juvenile anadromous or resident species (including Delta smelt). After May 15, the EWA agencies could request that exports continue at some reduced stable level or allow exports to ramp up gradually between May 16 and June 1. These additional days of reduced exports would provide additional protection for juvenile anadromous and resident estuarine species.

2.4.2.1.4 Export Reductions in June and July

Delta pumping reductions in June could decrease losses of juvenile Delta smelt and splittail. Also, a gradual increase (ramp up) rather than a rapid increase of exports during June may be used to increase survival of both anadromous and resident estuarine species in the south/central Delta. In some years, these actions may continue into the early part of July.

Pumping reductions would decrease the effects of CVP/SWP export facilities on listed resident fish in the south Delta and would enable juvenile resident estuarine and anadromous species to migrate away from the export pumping facilities where they are less vulnerable to direct loss and/or direct mortalities associated with export operations. Data indicate "incidental take" is greater when fish population densities are high near the export facilities or when exports increase. Additional information indicates that, generally, when the export rate increases rapidly under low Delta

inflow and fish densities are high in the south/central Delta, the fish losses at the facilities can be high.

2.4.2.2 Delta Cross Channel Gates Closure

As discussed for the baseline level of fishery protection (Section 2.3.3), closing the DCC gates would increased the likelihood that juvenile spring-run and winter-run Chinook salmon and steelhead smolts remain in the mainstem Sacramento River, which would improve their survival and likelihood of successful out-migration through the western Delta and San Francisco Bay.

When DCC gates are closed outside the regulatory baseline, EWA agencies would compensate water users for water supply losses from these reductions. Additional gate closures would typically occur in November, December, January, May, or June, if additional closures were needed after the regulatory requirements of the baseline level of fisheries protection were met.

2.4.2.3 Increasing Instream Flows

Increasing instream flows would improve habitat conditions for anadromous and resident fish. The Proposed Action would include flow increases beyond those in the baseline level of fisheries protection (Section 2.3.4). Table 2-4 shows fish species that could require supplemental flows in various rivers and tributaries to meet habitat requirements for the various life history stages. The table also displays the timing of each life history stage and the rivers (those affected by EWA actions) in which each fish species can be found.

Supplemental flows above the existing baseline level of fishery protection for instream flows would provide additional water that primarily benefits salmon and steelhead adult immigration, spawning, egg incubation, rearing, and emigration of juveniles through the regulation of pulse flows, water temperature, water quality, and the maintenance of attraction and flushing flows. Instream flows may also aid white and green sturgeon emigration, spawning, egg incubation, and rearing and American shad spawning, incubation, and rearing.

The EWA instream flow actions would occur on the waterways where the EWA purchases assets, including the Sacramento, Feather, Yuba, American, Merced, and San Joaquin Rivers. The EWA actions to increase instream flows would use the AFRP as a guide to identify the times and locations that supplemental flows are needed. The CALFED Environmental Water Program (EWP) and the CVPIA (b)(2) water both help to meet the above objectives. CVPIA (b)(2) water can currently be used to augment instream flows, and the EWP may be able to take these actions in the future.

Table 2-4
Anadromous Fish Life History Stages and Locations

Fish	*Run*	*Stage*	*Month*	*Location*
Chinook Salmon	Fall	Immigrating adult	July – December	Sacramento, Feather, Yuba, American, San Joaquin, Merced
		Spawning	October – December	
		Emigrating juvenile	January – June	
	Late-fall	Immigrating adult	October – April	Sacramento, Feather, Yuba
		Spawning	December – April	
		Emigrating juvenile	May – December	
	Winter	Immigrating adult	December – July	Sacramento
		Spawning	Late April - mid-August	
		Emigrating juvenile	August – March	
	Spring	Immigrating adult	March – September	Sacramento, Feather, Yuba
		Spawning	Mid-August – October	
		Emigrating juvenile	November – June	
Steelhead	Central Valley	Immigrating adult	August – March	Sacramento, Feather, Yuba, American, San Joaquin, Merced
		Spawning	December – April	
		Emigrating juvenile	January - October	
American shad		Immigrating adult	April – May	Sacramento, Feather, Yuba, American, San Joaquin
		Spawning	June – July	
		Emigrating juvenile	August – October	
Green Sturgeon		Immigrating adult	February – June	Sacramento
		Spawning	March – July	
		Emigrating juvenile	June – August	
White Sturgeon		Immigrating adult	February – May	Sacramento, American, San Joaquin
		Spawning	May – June	
		Emigrating juvenile		

Source: Final Restoration Plan for the Anadromous Fish Restoration Program (AFRP Plan) (USFWS 2003)

2.4.2.4 Augmenting Delta Outflows

Fresh water from the Delta flows to the San Francisco Bay, which is more saline than the Delta estuary. The fresh water mixes with salt water in the Suisun Bay area, and the mixing zone location varies depending on the Delta outflow. Higher amounts of Delta outflow push the saltwater mixing zone farther out to the Bay, and lower flows allow the saltwater zone to move farther into the Delta. Augmenting Delta outflows could move the saltwater mixing zone farther into the Bay, improving the water quality within the Delta. The Proposed Action could include actions to augment Delta outflow in addition to outflows required by the SWRCB's Decision 1641 and the existing baseline of fishery protection. Augmenting Delta outflow would also help to restore a more natural flow pattern through the Delta, which would help outmigrating fish.

In addition to taking direct actions to augment Delta outflows, other actions within the Proposed Action would have the secondary benefit of increasing Delta outflows. When the EWA agencies reduce Delta export pumping, the water that would have been pumped becomes Delta outflow. Delta outflow would also increase during the summer months when EWA assets are moved through the Delta because the transfers

must include outflow water to maintain water quality (see Section 2.4.3.1 for additional information).

2.4.2.5 Decision-Making Process

A multi-agency team called the EWA Team (EWAT) would recommend when fish actions should be taken, using a consensus process based on biological indicators for the species considered to be at immediate risk. EWAT would consider the technical input of the Data Assessment Team (DAT), which includes stakeholder representatives, when deciding when fish actions should be taken. When the EWAT cannot reach consensus or decides issues should be elevated, issues would be presented to the Water Operations Management Team (WOMT) for resolution. Decisions would be reported to the CALFED Operations Group involving agency and stakeholder representatives. Appendix C includes the existing decision trees for Delta smelt and Chinook salmon used by the DAT. Their decisions are not solely based on the take limits at the export pumps.

In November and December, the EWA agencies would begin the process of identifying placeholders[13] for the next year in coordination with the (b)(2) interagency team. These placeholders would be determined based upon biological objectives and hydrology (which includes the latest forecast/allocation study for both the CVP and SWP). These placeholders would then be evaluated monthly to determine whether they are still applicable for the current month or for the following months (up until June). The use of the EWA placeholders in a particular month would be based upon the biological decision trees for salmon and Delta smelt and real-time monitoring. If not used in a particular month the placeholders would be reassigned and used in another month. The purposes in identifying these placeholders is to assist the Project Agencies in acquiring contracts for water purchases and to inform the EWA agencies of upcoming EWA actions.

2.4.3 Asset Acquisition and Management

This section is organized according to the geographic areas in which the EWA Project Agencies acquire and/or manage assets for the Proposed Action: upstream from the Delta (Section 2.4.3.1), the Delta (Section 2.4.3.2), and the export service areas (Section 2.4.3.3). Figure 2-4 shows each of these areas.

The EWA Project Agencies would use any of the acquisition methods described below to purchase water. Flexibility to purchase from any of these sources is critical to helping the EWA run efficiently because it would allow the Project Agencies to purchase the least expensive water available in any given year. Table 2-5 lists agencies that may be willing to sell water to the EWA or have sold water to the EWA in past years,[14] along with a general range of potentially available water volumes. None of

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[13] Placeholders are the best available estimate of the water that the fish would need in the upcoming year.

[14] Information on past EWA transactions can be found online at http://wwwoco.water.ca.gov/calfedops/2001ops.html or http://wwwoco.water.ca.gov/calfedops/2002ops.html

the purchases in Table 2-5 are guaranteed; the EWA Project Agencies could only make purchases if a seller is willing to participate.

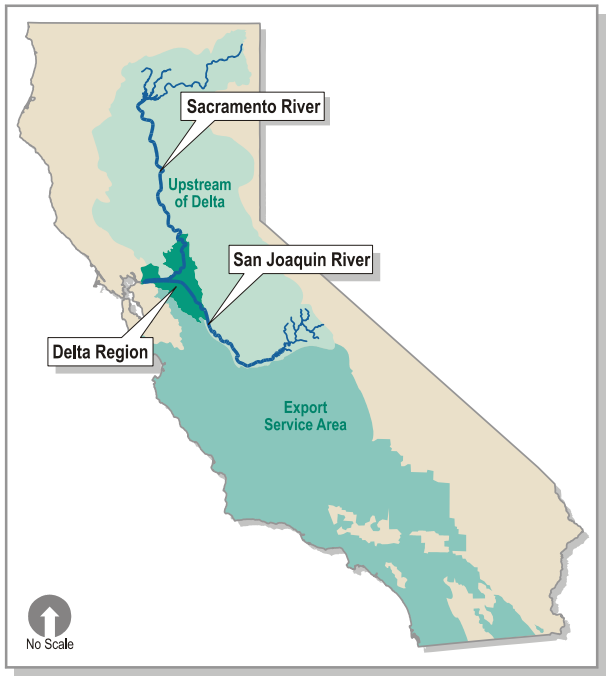

Figure 2-4
Asset Acquisition and Management Areas

The numbers presented in Table 2-5 are estimates and do not necessarily reflect the amount of water that would be available in any given year. Generally, these estimates reflect the potential upper limit of available water in order to include the maximum extent of potential transfers in the environmental analysis. Some of the agencies listed in Table 2-5 indicated an interest in transferring water to the EWA, but could not provide a range of potential available water supplies. The numbers in the table include estimates provided either by water sellers or the Project Agencies. Actual purchases would depend on the year type, EWA funding, and the amounts that sellers would be willing to transfer in a given year.

The potential acquisitions in Table 2-5 would not all occur within a single year. The table is simply a menu that illustrates the flexibility the EWA Project Agencies have in making purchases. Figure 2-5 shows the locations of the water agencies listed in Table 2-5.

Table 2-5 does not contain an exhaustive list of potential EWA sellers; additional agencies may decide at any time that they wish to sell water to the EWA. An analysis of the potential environmental effects of transferring water, however, requires information on the transfer sources. The environmental analysis in this document includes the effects associated with the potential transfers in Table 2-5. Other future water transfers that require a supplemental Environmental Assessment or ASIP would tier from this document. Water transfers that meet and implement the conservations measures developed in this document for the specific resources identified may not need second-tier environmental documentation once the transfers have been reviewed by the Project Agencies and are found to be in compliance with these conservation measures.

Table 2-5
Potential Asset Acquisitions and Management for the Proposed Action (Upper Limits)

	Range of Possible Acquisitions (TAF)				*Management*	
Water Agency	***Stored Reservoir Water***	***Groundwater Substitution***	***Crop Idling/ Subst.***	***Stored Groundwater Purchase***	***Ground-water Storage Services***	***Source Shifting/ Pre-Delivery***
Upstream from the Delta Region						
Sacramento River Area of Analysis						
Glenn-Colusa ID		20-60	100			
Reclamation District 108		5	45			
Anderson Cottonwood ID		10-40				
Natomas Central MWC		15				
Feather River Area of Analysis						
Oroville Wyandotte ID	10-15					
Western Canal WD		10-35	70			
Joint Water Districts		20-60	65			
Garden Highway MWC		15				
Yuba River Area of Analysis						
Yuba County WA	100	85				
American River Area of Analysis						
Placer County WA	20		10			
Sacramento GW Authority				10		
Merced/San Joaquin River Area of Analysis						
Merced Irrigation District		10-25				
Export Service Area						
San Joaquin Valley						
Kern County WA			115	50-165	X	X
Semi-Tropic WSD[1]					X	
Arvin-Edison WSD[1]					X	
Westlands WD			195			
Tulare Lake Basin WSD			110			
Santa Clara Valley						
Santa Clara Valley WD						X
Southern California						
Metropolitan WD						X

Abbreviations:
GW: Groundwater
ID: Irrigation District
MWC: Mutual Water Company
WA: Water Agency
WD: Water District
WSD: Water Storage District

Footnote 1: Semi-Tropic WSD and Arvin-Edison WSD are within Kern County Water Agency. Their groundwater storage facilities are separate from the Agency, but they may participate in other programs that the agency helps administer, such as crop idling.

2.4.3.1 Upstream from the Delta Region

As shown in Figure 2-5, the Sacramento and San Joaquin Rivers both flow into the Delta; therefore, these rivers and their tributaries are designated in this document as the Upstream from the Delta Region. Potential asset acquisitions in the Upstream of Delta Region include stored reservoir water, groundwater substitution, crop idling/substitution, and stored groundwater purchase (See sections 2.4.3.1.1 – 2.4.3.1.4.). The EWA agencies could use assets acquired in this region for multiple purposes, but would generally use assets to protect and restore fish species that are affected by the conflicts at the Delta export pumps, which is the primary objective of the EWA. The EWA actions would protect and restore fish at the pumps by reducing pumping when it would help at-risk fish species, then transferring EWA assets across the Delta at other times to repay CVP and SWP users for water lost during pump reductions.

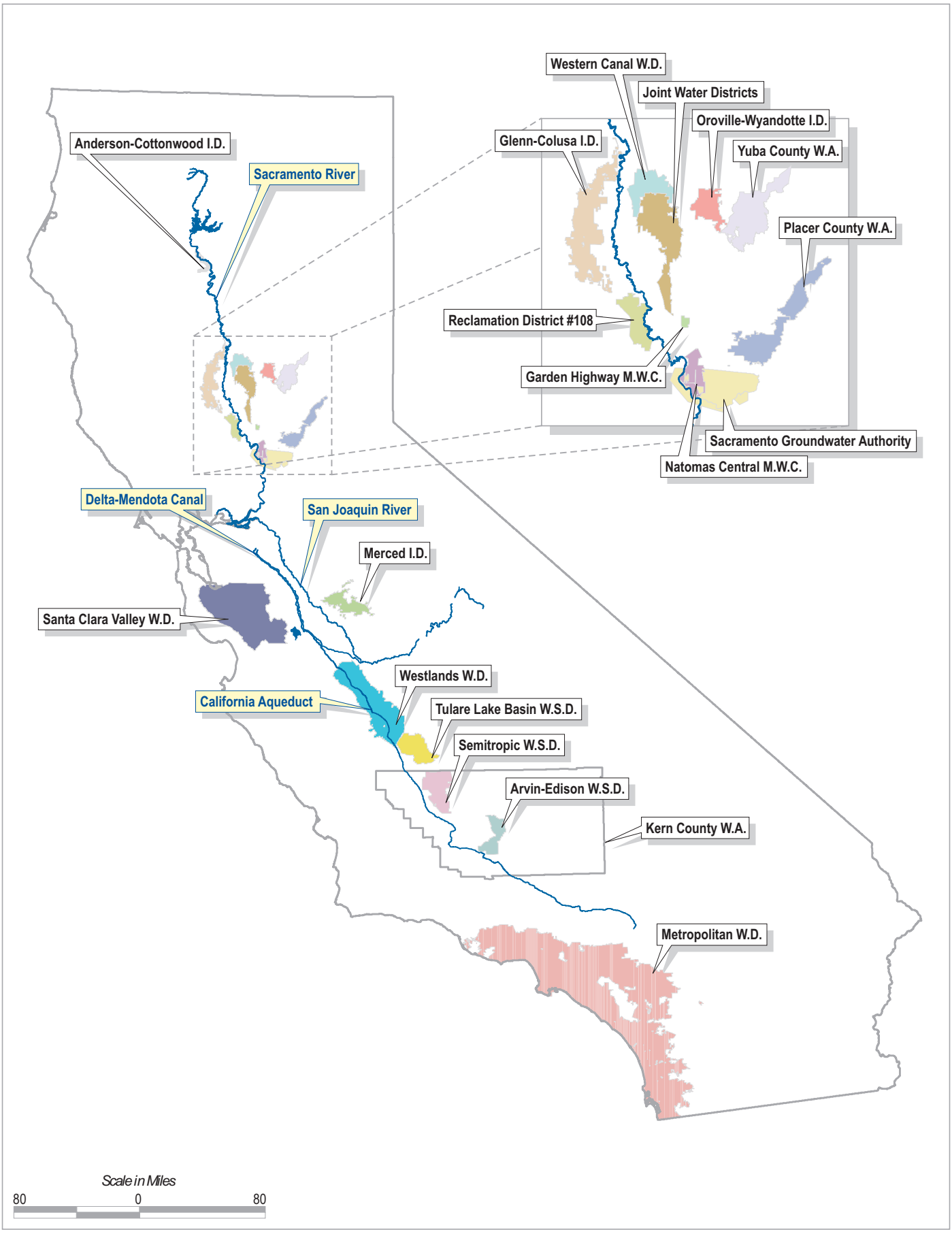

Figure 2-5
Potential Asset Acquisition and Management Participants

Both the CVP and SWP both have pumping plants in the southern portion of Delta - the Tracy Pumping Plant and the Harvey O. Banks Delta Pumping Plant, respectively. The Project Agencies use these pumping plants to pump water to users in the Export Service Area. Cross-Delta transfer capacity would be generally available to the EWA when the Delta is in balanced conditions, the SWP pumps are operating below their maximum permitted capacity to deliver water to contractors, and there is no reduction for fish purposes. Typically, the CVP pumps are operating at full capacity for most of the year (except in dry years), so the EWA would primarily use the SWP pumps.

Delta pump availability varies by year type. The pumps are active during the wet season when the winter rains and spring snowmelt provide high flows into the Delta. New Bay-Delta standards,[15] however, impose pumping restrictions during some of the high-flow periods. During wet years, high flows and the opportunity to divert those flows occur later in the spring than during dry years. In dry years, more unused capacity at the Delta pumps would be available, and more transfer water can be moved through the Delta. Typically, EWA water is moved through the Delta from July through September, although the Project operators could start moving EWA water in mid-June if fish were not in the area of the export pumps.

The asset acquisition types have associated date ranges (discussed in each section below) during which water may be transferred, depending on local conditions and Delta conveyance availability. The ranges listed cover the entire length of time when transfers may occur, but the transfers would not usually continue for the entire period. For example, if a reservoir takes approximately 1 month to release water, the range may include 3 months because water could be released at any time during that timeframe.

Shifting pumping to times that are less sensitive to fish would increase pumping during times when fish are absent, which sometimes requires increased Delta outflow to comply with water quality regulations in the Delta. Carriage water is defined as the additional water needed for Delta outflow to compensate for the additional exports made on behalf of a transfer to assure compliance with water quality requirements of the SWP and CVP. Generally, more water must be released during a transfer than could reach the pumps, as some of the transferred water would flow to the ocean as Delta outflow. The Project Agencies computed the carriage requirements at 15 percent of the transfer volume for the 2001 summer transfer season and 20 percent for the 2002 summer transfer season (Pettit-Polhemus 2003b). EWA transfers from the Upstream from the Delta region would incorporate enough carriage water to maintain water quality within the Delta at without-EWA constituent levels. The EWA's process for incorporating carriage water is described in more detail in Chapter 5.

Transfers along the San Joaquin River are charged a 10 percent conveyance loss to include seepage and evaporation losses. The EWA agencies must factor Delta carriage

[15] These standards include requirements from several biological opinions and the 1995 Delta WQCP, as defined in Section 2.3.1.1.

and conveyance losses into the determination of the total amount of water that must be acquired to fully compensate for EWA actions to benefit fish and the environment.

2.4.3.1.1 Stored Reservoir Water

The EWA Project Agencies could acquire water by purchasing surface water stored in reservoirs owned by non-Project entities (those that are not part of the CVP or SWP). To ensure that purchasing this water would not affect downstream users, EWA agencies would limit assets to water that would not have otherwise been released downstream. In most cases, the stored reservoir water sellers could demonstrate that they would have maintained water in storage without the transfer.

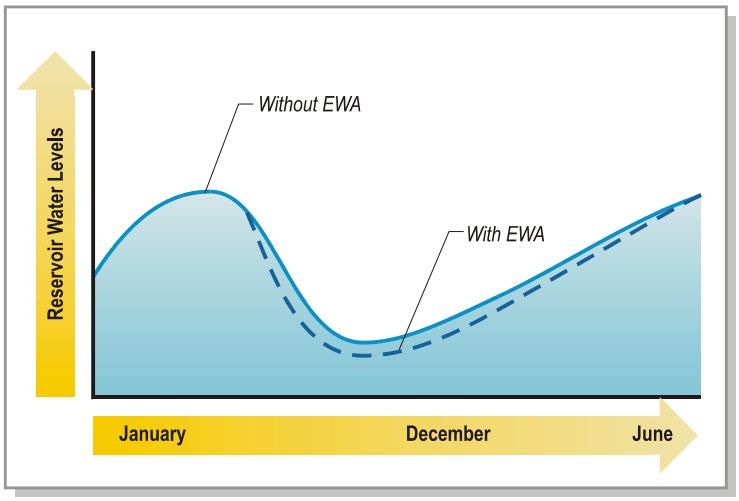

Figure 2-6
Reservoir Level Changes Due to Stored Reservoir Water Purchases

When the EWA purchases stored reservoir water, these reservoirs would be drawn down to lower levels than without the EWA, as shown in Figure 2-6. To refill the reservoir, a seller must prevent some flow from going downstream. Sellers must refill the storage at a time when downstream users would not have otherwise captured the water, either in downstream project reservoirs or with project pumps in the Delta.[16] In these cases, instream flow caused by refill would decrease during the wet season, but would not decrease below minimum flow requirements. Stored reservoir water is released in addition to reservoir water that would be released without the EWA, thereby increasing flows in downstream waterways.

The EWA Project Agencies may purchase stored reservoir water from Oroville-Wyandotte Irrigation District (Sly Creek and Little Grass Valley Reservoirs), Yuba County Water Agency (New Bullards Bar Reservoir), and Placer County Water Agency (French Meadows and Hell Hole Reservoirs). The sections below describe operations associated with each of these potential acquisitions.

<u>Feather River</u>

Oroville-Wyandotte Irrigation District has multiple reservoirs as part of its South Fork Project and would sell water to the EWA out of Little Grass Valley and Sly Creek Reservoirs (see Figure 2-7). Water from Little Grass Valley Reservoir would flow through the South Fork Diversion tunnel into Sly Creek Reservoir. Sly Creek Reservoir receives water from upstream tributaries, Little Grass Valley and Slate

[16] Section 4.2.8 of the Draft EIS/EIR describes the refill criteria established for non-project reservoirs to prevent EWA purchases from affecting downstream users.

Creek (a tributary to the Yuba River). The water from Sly Creek Reservoir would pass into Lost Creek Reservoir, where it would enter a series of tunnels to generate power between Lost Creek and Ponderosa Reservoirs. The water released from these reservoirs would not typically enter the South Fork of the Feather River or Lost Creek as it flows downstream to Lake Oroville.

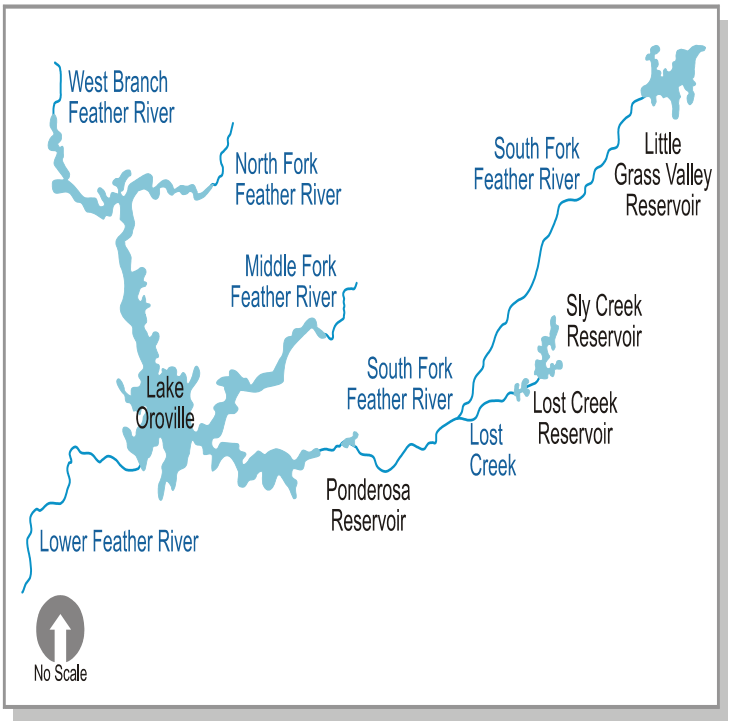

Figure 2-7
Feather River Water Facilities

Oroville-Wyandotte's water is available from October to December, prior to the typical EWA transfer season and the time when the assets would be used, so it would be stored in Lake Oroville through the winter and into the following summer when the Delta pumps have available capacity.

As a result of an acquisition from Oroville-Wyandotte Irrigation District, water levels in Sly Creek and Little Grass Valley Reservoirs would be lower than under non-EWA conditions from November until the reservoirs refill. Lake Oroville would store the releases until the following summer, increasing Oroville water elevations relative to non-EWA conditions from October until September. The acquisition water would be released from Lake Oroville in mid-June through September, increasing downstream flows over the conditions without the EWA.

Sly Creek and Little Grass Valley Reservoirs would refill, as excess water is available, decreasing releases from these reservoirs. Of the releases from these reservoirs that exceed the required downstream flows, most are diverted into the power generation facilities; therefore, refilling the reservoirs should not change riverflows. Sly Creek, however, receives some water from Slate Creek, a tributary of the Yuba River, and refill may also affect the Yuba River.

This pattern of releases results in EWA water stored in Lake Oroville through the wet season, but as the EWA has the lowest priority for storage, EWA assets would be the first to spill if the reservoir storage reaches flood control levels. This option carries a risk that the assets may not be available in the spring. As part of the purchase contract, the EWA agencies would include a "spill protection term" to ensure that if the water spills from Oroville, the EWA would not have to pay for it.

Yuba River

Yuba County Water Agency (YCWA) would sell water to the EWA from New Bullards Bar Reservoir, on the North Fork of the Yuba River. These acquisitions would be stored in New Bullards Bar Reservoir until the Delta pumps have available capacity to transfer the water south. Once released from New Bullards Bar Reservoir, the water would travel through a series of tunnels to generate power, and enter the upstream end of Englebright Lake (Figure 2-8).

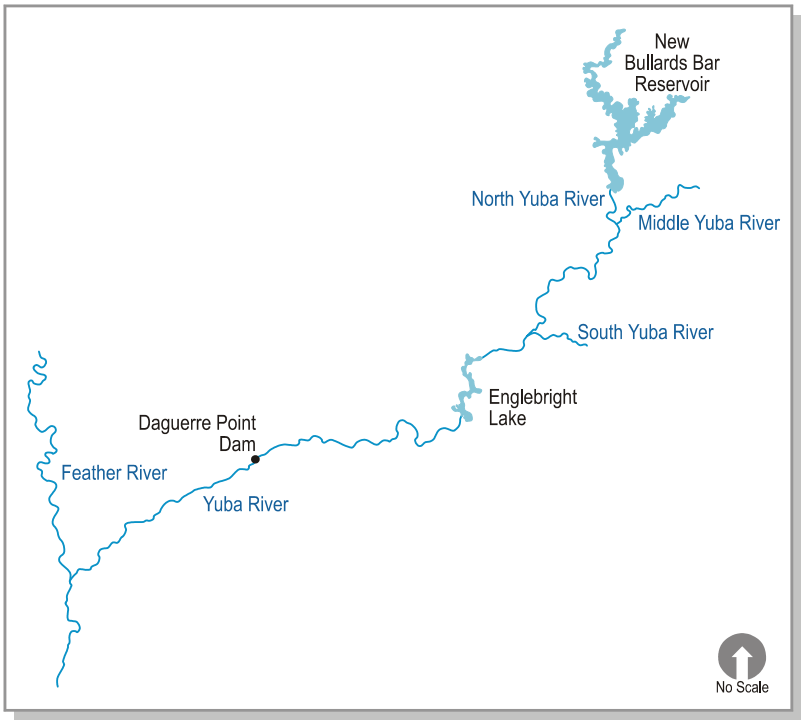

Figure 2-8
Yuba River Water Facilities

Withdrawing water from the reservoir would lower the surface water elevations relative to the non-EWA conditions from mid-June until the reservoir is refilled. If assets were released in mid-June through September, flows would increase in the Yuba River downstream from Englebright Lake. New Bullards Bar Reservoir would refill as water is available in the Yuba River, which would decrease flows downstream from the reservoir.

American River

Placer County Water Agency would sell water to the EWA Project Agencies from Hell Hole and French Meadows Reservoirs, on the Middle Fork of the American River (see Figure 2-9). It would take the agency 2-3 months to move the water downstream to Folsom Lake, where the water could be held until the EWA agencies are ready to release it. The water could be released from Hell Hole and French Meadows as early as June and until as late as October. Hell Hole and French Meadows would have lower surface water elevations than they would without the EWA from June until the reservoirs refill. Refilling the reservoirs would decrease flows downstream from the Ralston Afterbay.

Water from both French Meadows and Hell Hole Reservoirs would enter a series of tunnels through power generation facilities, and these tunnels would release the water at Ralston Afterbay. While water is being released, the Middle Fork of the American would convey increased flows from Ralston Afterbay downstream to Folsom Lake. These releases could occur from June through October. Folsom Lake would hold the water until the EWA agencies are ready for it to be released. Folsom

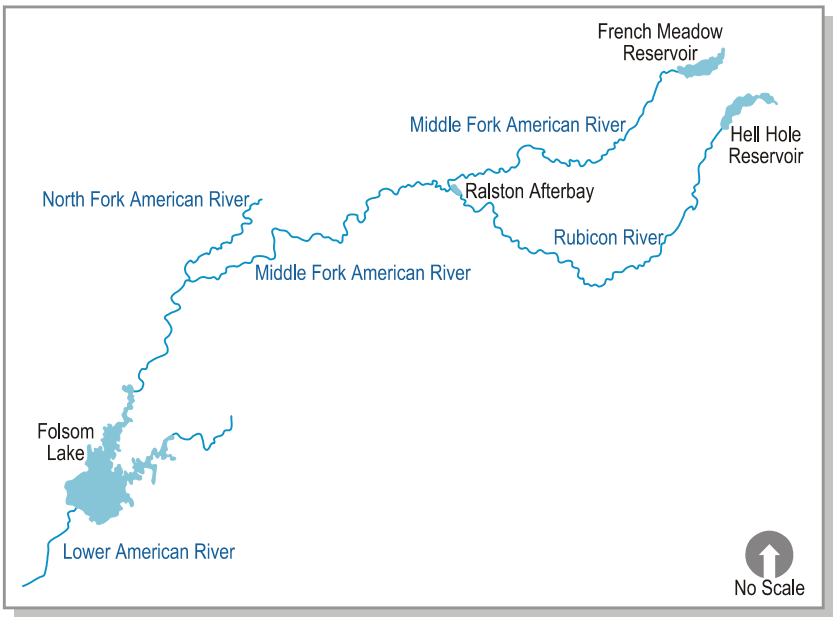

Figure 2-9
American River Water Facilities

Lake elevations would be higher with the EWA water than would be the case without the water. As the EWA assets were released, the lake level would be restored to the non-EWA levels.

On the American River, the EWA agencies may use assets to accomplish instream objectives and may move assets to users downstream from the Delta to make up for pumping reductions. If used for additional instream flows, the water may be released at a time when it could not be pumped through the Delta. During the summer (mid-May to mid-October), water may be released for steelhead temperature requirements. Additional instream flows are needed in October to December for Chinook salmon and steelhead spawning. The EWA agencies would release the water from Folsom to meet these multiple objectives, resulting in release periods from June through December.

2.4.3.1.2 Groundwater Substitution

Groundwater substitution transfers occur when users forego their surface water supplies and pump an equivalent amount of groundwater as an alternative supply. Because the EWA's potential groundwater substitution transfers are from agricultural users, the water from this acquisition method would be available during the irrigation season of April through October. Typically, surface water made available through groundwater substitution is stored upstream until the Delta pumps have the capacity available for EWA assets (except on the Sacramento River, as described later).

Groundwater substitution transfers would withdraw additional water from the groundwater basin below the participating users, so this option could only be used in basins that are not in a state of groundwater overdraft, or in areas where the water

supplier determines that the water transfer would not contribute to the groundwater overdraft.[17]

The Delta pumps would be unlikely to have available capacity for the EWA at the start of the irrigation season. EWA water that would have been released for irrigation would instead be held in reservoirs until later in the season, which would cause reservoir levels to be slightly higher than without the EWA while the water is held back (except on the Sacramento River, as described later). The reservoir levels would not reverse their typical summer declines because the EWA program would not add new water to the reservoir; rather, the levels would decrease more slowly (see Figure 2-10). EWA water acquired through groundwater substitution would be released later in the irrigation season, typically mid-June through September, at times when through-Delta conveyance capacity is available. The change in reservoir elevations as the water is released would depend on the Delta conveyance capacity. If the conveyance capacity were available constantly throughout the period of mid-June through September, then the reservoir elevations would slowly return to the without-EWA levels (see Scenario 1 on Figure 2-10). If more conveyance capacity were available in July than later in the summer, then the EWA could borrow water from the storage facility and release additional water at those times that the conveyance capacity is available (see Scenario 2 on Figure 2-10).

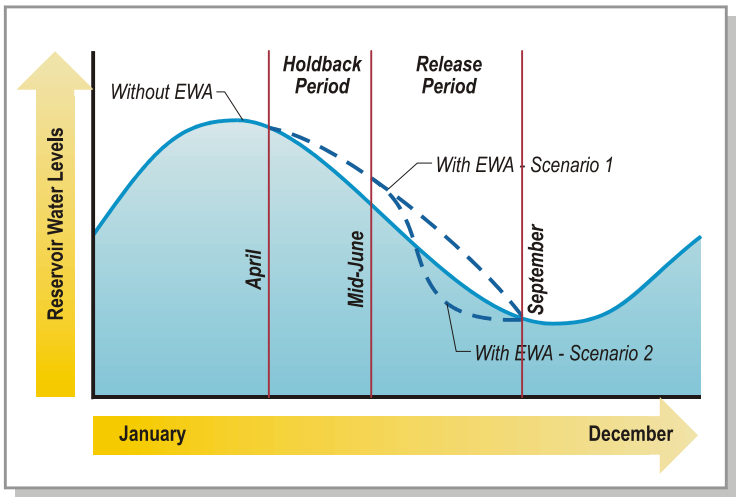

Figure 2-10
Reservoir Level Changes Due to Groundwater Substitution Transfers

The EWA Project Agencies may engage in groundwater substitution transfers with Glenn-Colusa Irrigation District, Reclamation District 108, Natomas Central Mutual Water Company, Anderson Cottonwood Irrigation District, Western Canal Water District, Joint Water District, Garden Highway Mutual Water Company, Yuba County Water Agency, and Merced Irrigation District. The sections below describe operations associated with each of these potential acquisitions.

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[17] According to California Water Code 1745.10: A water user that transfers surface water pursuant to this article may not replace that water with groundwater unless the groundwater use is either of the following:
(a) Consistent with a groundwater management plan adopted pursuant to state law for the affected area.
(b) Approved by the water supplier from whose service area the water is to be transferred and that water supplier, if a groundwater management plan has not been adopted, determines that the transfer would not create, or contribute to, conditions of long-term overdraft in the affected groundwater basin.

Sacramento River

Sacramento River agencies (Glenn-Colusa Irrigation District, Reclamation District 108, and Natomas Central Mutual Water Company) receive CVP water that is stored upstream from their service areas in Lake Shasta, a CVP facility. While theoretically possible, the EWA agencies would probably not be able to reduce releases from Lake Shasta to sore water until Delta pumps become available because all of the flow released from Lake Shasta is needed to meet downstream temperature requirements or the flow requirement at Wilkins Slough.[18] There is a possibility that EWA water could be held back in Lake Shasta during certain years (usually dry or critical years) when releases are not needed to meet downstream requirements. In most years, however, the EWA agencies would ask that water agencies agreeing to groundwater substitution transfers only transfer water when the Delta pumps have available capacity (where irrigators would continue to use their surface water supply until around June, then switch to groundwater). Less water would be available with this strategy than with others, but the water has a higher likelihood of being usable for EWA actions. It would be possible for each scenario to occur in different year types.

If water were held back in Lake Shasta, the water surface elevations during the hold-back period (April through June) would be slightly higher than they would be without the EWA. As the water is released, the reservoir levels may be higher or lower than the without-EWA levels and would slowly return to the without-EWA levels by the end of September. The river, between Shasta and the water agencies' usual diversion point, would convey less water than it would without the EWA during the hold-back period (April through June) because the EWA water would be held in Shasta. Flows would not decrease below those needed for flow or temperature requirements. The river would then carry more water than during non-EWA conditions in mid-June through September, when the Delta pumps have availability for EWA water.

If users shift from surface water to groundwater after the Delta pumps are available, the riverflows would not decrease because no water would be held back in Shasta. Riverflows would increase from the water agencies' usual diversion point downstream to the Delta pumps. The effect analysis focuses on the option of holding water back because the analysis includes the potential adverse effect of decreasing riverflows as well as increasing riverflows when the Delta pumps have available capacity.

Feather River

The Feather River districts, including Western Canal Water District and the Joint Water District Board, receive SWP water stored in Lake Oroville (an SWP facility). Water levels in Lake Oroville would be higher than without the EWA from April through June, while water would be held back because of Delta pump unavailability. The water levels in Lake Oroville may be lower or higher than without the EWA from July to September, depending on when cross-Delta conveyance is available. These districts do not divert from the river, but rather divert water that is released from Lake Oroville directly into the Thermalito Afterbay (see Figure 2-11). This water does

[18] These requirements are described in detail in the Modeling Description, Appendix B.

not flow through the river without the EWA, so an EWA acquisition would not change riverflows if assets were held in Lake Oroville early in the season. The assets would be conveyed through the river later in the season (from mid-June through September), when the Delta pumps are available, increasing flows over the conditions without the EWA.

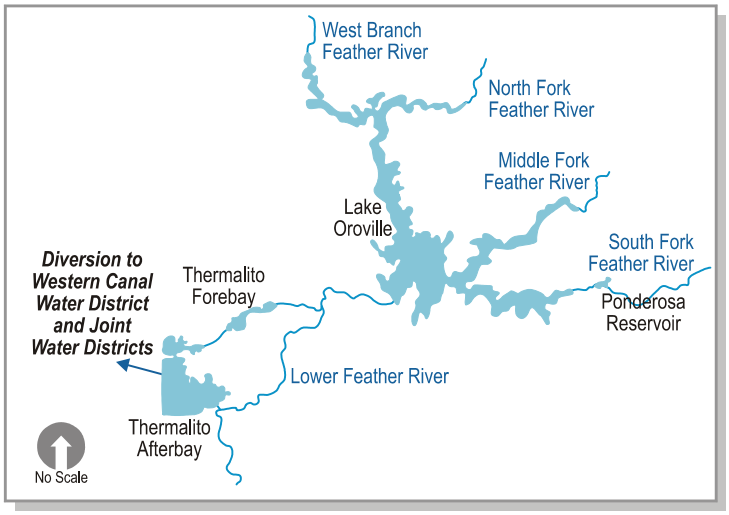

Figure 2-11
Diversion Locations for Feather River Sellers

Yuba River

Yuba County Water Agency, on the Yuba River, owns New Bullards Bar Reservoir and would store groundwater substitution assets there until release. Water elevations in New Bullards Bar Reservoir would be slightly higher than without the EWA from April through June as a result. During the release period, the EWA agencies would try to maintain relatively constant flows on the Yuba River because of fish concerns; therefore, the water levels in New Bullards Bar Reservoir would stay higher than the levels without the EWA from July to September. Many of the Yuba County Water Agency's customers divert at Daguerre Point Dam, which is downstream of New Bullards Bar Reservoir. Flows between New Bullards Bar Dam and Daguerre Point Dam would decrease relative to the conditions without the EWA early in the season (April through mid-June). Flows downstream from New Bullards Bar Dam would increase relative to the conditions without the EWA later in the season, when the Delta pumps have availability (mid-June through September).

Merced River

The Merced Irrigation District is on the Merced River and would store EWA water in its reservoir, Lake McClure, until release (see Figure 2-12). Water elevations in Lake McClure would be slightly higher from April through November than they would be without the EWA. The EWA agencies would convey a Merced Irrigation District groundwater substitution transfer through the Merced and San Joaquin Rivers. EWA agencies have worked together to schedule these transfers for periods when the temperature would be acceptable for fish migration. Assets would be transferred via

the rivers in October and November, increasing flows during those times and providing an attraction flow for spawning salmon.

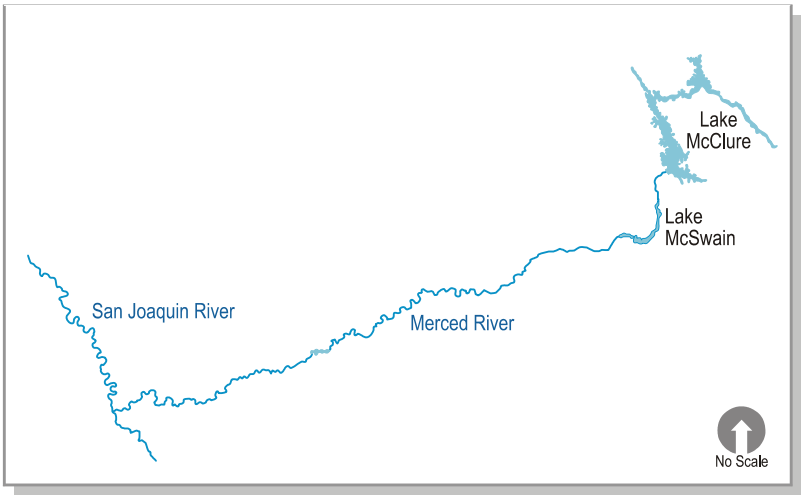

Figure 2-12
Merced River Water Facilities

2.4.3.1.3 Crop Idling or Crop Substitution

Crop idling transfers come from water that would otherwise have been used for agricultural production. For crop idling acquisitions, the EWA agencies would pay farmers to idle land that they would otherwise have placed in production. Crop idling acquisition assets would be retained in reservoirs upstream from the selling water agencies until they could be transferred through the Delta and pumped south. Payment by the EWA agencies for water transferred would be computed based on pre-agreed consumptive use values, which may be refined as the science for generating these values improves. The EWA agencies are considering purchasing water from idled rice crops only in the Upstream of Delta Region for several reasons:

- Rice provides the largest amount of water per acre idled (approximately 3.3 acre-feet per acre);
- Rice crops are less labor-intensive than other potential crops, requiring approximately 2.7 full-time labor equivalents per 1000 acres;
- Rice farmers have expressed interest and have participated in idling programs in the past; and
- Like other small grain crops, rice is not a permanent crop and brings in less revenue than permanent, horticultural crops (e.g., fruits and nuts), so farmers would likely be more willing to fallow.

The potential also exists for the EWA agencies to purchase water through crop substitution, in which water users substitute a crop with lower water needs than the crop that they would have otherwise planted. The associated decrease in water use could be transferred to the EWA. Crop substitution would have similar but lesser

effects than crop idling, so it is considered to be a part of the crop idling discussion for the remainder of the document.

To minimize socioeconomic effects on local areas, the EWA agencies would not purchase water via crop idling if more than 20 percent of recent harvested rice acreage in the county would be idled through EWA or other program water acquisitions. The EWA agencies chose this figure because of historical precedents and Water Code Section 1745.05 (b).

The EWA Project Agencies may purchase water through crop idling transfers from Glenn-Colusa Irrigation District, Reclamation District 108, Western Canal Water District, and the Joint Water District. The mechanisms for transferring water from crop idling would be very similar to those described above for groundwater substitution. The transferred water would be held in reservoirs during months when it could not be pumped through the Delta export pumps, then released during the months when the Delta pumps have availability.

Sacramento River

The EWA Project Agencies could purchase water through crop idling from Glenn-Colusa Irrigation District and Reclamation District 108 on the Sacramento River. As described above for groundwater substitution transfers, releases from Lake Shasta would probably need to be maintained during April and May to meet downstream temperature and flow requirements. Therefore, water acquired from sellers on the Sacramento River could not be backed up into Lake Shasta and cannot be transferred until the Delta pumps are available to the EWA. Unlike groundwater substitution, farmers could not postpone crop idling until June. Crop idling water would be available at the beginning of the season as soon as the crop is not planted. The EWA agencies would likely receive less water from crop idling transfers along the Sacramento River than from crop idling transfers along other rivers because the water made available along the Sacramento River in April, May, and possibly June might be pumpable in the Delta. The modeling efforts indicate that the EWA agencies could not capture and use approximately 30-50 percent of the water, except in extremely dry years when added flows in April and May would provide system-wide benefits that the EWA agencies could use.

Feather River

Crop idling transfers from Western Canal Water District and the Joint Water District on the Feather River would function in the same way as transfers from groundwater substitution. Water elevations in Lake Oroville would be higher than they would be without the EWA during the April through June holdback period. From July to September, the levels would be higher or lower than they would be without the EWA, depending on the through-Delta conveyance capacity. The participating districts do not divert water directly from the Feather River, but instead divert water that is released from Lake Oroville directly into the Thermalito Afterbay. This water does not flow through the river without the EWA, so an EWA acquisition would not change riverflows if assets were held in Lake Oroville early in the season. Riverflows

would increase when the Delta pumps have availability, typically during July through September.

2.4.3.1.4 *Stored Groundwater Purchase*

The EWA Project Agencies could obtain water by purchasing groundwater assets that were previously stored by the selling agency with the intent to sell a portion of those assets at a later date. This option differs from groundwater substitution in that groundwater substitution transfers would not come from water that had been previously stored. In the Upstream of Delta Region, the EWA Project Agencies may purchase previously stored groundwater from the Sacramento Groundwater Authority.

American River

The EWA Project Agencies would purchase water from the Sacramento Groundwater Authority, which would deliver water through an exchange at Folsom Lake. Agencies in the authority would exchange some of their allotment in Folsom Lake with the EWA and pump previously stored groundwater[19] within their agencies to make up for the decrease in surface water supply. Any member of the Sacramento Groundwater Authority may participate; potential participants include San Juan Water District, the City of Sacramento, Fair Oaks Water District, and Citrus Heights Water District.

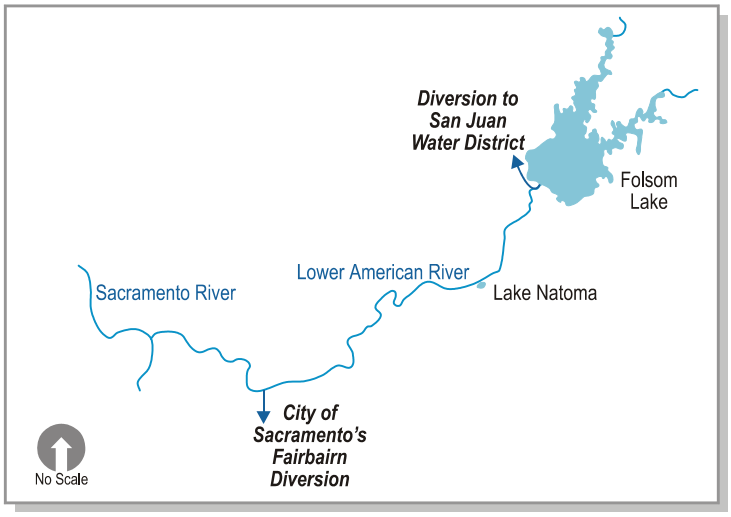

Figure 2-13
Diversion Locations for SGA Participants

San Juan Water District withdraws and treats water for itself and Fair Oaks Water District, Citrus Heights Water District, and some other SGA members directly from Folsom Lake; this water does not enter the lower American River (see Figure 2-13). SGA agencies would begin pumping groundwater and transferring surface water to the EWA once Reclamation is certain that Folsom Lake would not spill water, usually May at the earliest. The transfer could continue until mid-October, when the CVP would need to start preparing for flood control requirements and minimum flow requirements on the river. The EWA agencies would move the assets downstream through the Lower American River from June through December, depending on Delta pump availability and instream needs on the American River, as described above for stored reservoir purchase. This transfer would cause a slight increase over non-EWA conditions in Folsom Lake surface water elevations starting in May (before the Delta pumps are

[19] If the EWA agencies enter into a contract with Sacramento Groundwater Authority, the EWA agencies would verify that the water was previously stored to prevent effects to local groundwater.

available). Reservoir surface levels would return slowly to the non-EWA conditions as the water is released completely by December. Flows in the lower American River would be increased over non-EWA conditions from June through December during the transfer.

The City of Sacramento would reduce its diversions at its Fairbairn diversion point, shown on Figure 2-13. The City would not start pumping groundwater and transferring its surface water until Delta pumping capacity became available, typically starting in June. Releases from Folsom Lake would maintain the same pattern as before the transfer, but Sacramento's water would flow to the Delta instead of being diverted. This type of transfer would cause no change in Folsom Lake, but flows in the American River below Fairbairn would increase June through September.

2.4.3.2 Delta Area

The EWA Operating Principles specify methods for gaining assets in addition to those described above. These additional methods do not involve active acquisition; assets obtained by these other methods are termed "variable assets." The EWA agencies could obtain variable assets (water or pumping capacity) through changes in Delta operations.

The CALFED ROD lists the quantities of each of these assets that are expected to be available. These quantities were determined by gaming exercises that simulated project operations. During the past 2 years of EWA operation, the Project Agencies have found that some of these assets are not available on the same pattern as indicated by the CALFED ROD modeling efforts (shown in Table 2-6). The first variable asset involves acquiring (b)(2) water that has been released to meet instream flow objectives, but is diverted by the SWP because of limitations of the CVP's pumping capacity. Such flows may occur less often than the CALFED ROD predicted and less than in past years because of changes in (b)(2) water accounting imposed as a result of legal decisions (see Chapter 1 for a more detailed explanation).

Table 2-6
Acquired Variable Assets

Variable Asset Type	*CALFED ROD Estimate of Quantity*	*Acquired EWA Water from 10/2000 - 9/2001*[20]	*Acquired EWA Water from 10/2001 – 9/2002*
EWA share of (b)(2)/ERP Upstream Releases	40,000 acre-feet	46,079 acre-feet	3,308 acre-feet
Export Inflow Ratio Relaxation	30,000 acre-feet	1,829 acre-feet	79,306 acre-feet

Source: Pettit 2003

2.4.3.2.1 Sharing of (b)(2) and ERP Water

The SWP and the EWA would share, on a 50-50 basis, water pumped by the SWP that meets the following requirements:

[20] These numbers do not reflect conveyance losses from the pumping facilities to San Luis Reservoir. The CALFED modeling that produced the ROD estimates did not account for these losses; therefore, they are not included in the EWA numbers to provide accurate comparisons.

- Water released from storage or made available for upstream purposes under either (b)(2) or the ERP, arrives in the Delta with no further (b)(2) or ERP purposes to serve, and exceeds the export capacity of the CVP Tracy pumping plant;

- Water that the SWP and/or EWA have demand for south of the Delta; and

- Water the SWP has capacity to pump.

This type of variable asset would result in additional water for the EWA.

2.4.3.2.2 Joint Point of Diversion

The SWP can use excess capacity at its Harvey O. Banks Pumping Plant to pump water for both the CVP and the EWA, to be shared on a 50-50 basis, if the Projects meet the conditions in D-1641 (described in Section 2.3.1). The CVP water could be from either storage or the CVP's Delta water rights (to divert excess water). The EWA water could be from either non-Project water acquired Upstream from the Delta or stored or unstored water pumped under CVP or SWP water rights. If either the CVP or EWA were demand-limited,[21] the other's use of the Joint Point of Diversion would not count against its 50 percent share.

As stated in the EWA Operating Principles Agreement, use of excess capacity at Banks for the EWA and CVP would take precedence over all other non-Project pumping, except water wheeling in response to facility outages and wheeling to supply CVP contractors for whom the SWP has traditionally wheeled water. Pump usage for the EWA Operating Principles Agreement would be on an equal priority with Level 4 refuge supplies.[22]

The Project Agencies could use the Joint Point of Diversion to move EWA assets through the Delta, but the EWA agencies would still need to provide the assets to move. The Projects also have water rights to divert excess flows in the Delta, and the EWA Operating Principles Agreement allows the EWA to use these rights if excess pumping capacity and flows are available.

2.4.3.2.3 Relaxation of the Section 10 Constraint

The USACE granted permission to the SWP to relax the Section 10 constraint (of the Rivers and Harbors Act) and increase the base diversion rate by the equivalent of 500 cfs to an average of 7,180 cfs for the months of July through September, through 2002. If similar permission were obtained, this 500 cfs would be dedicated to pumping for the EWA, but the EWA agencies would still need to provide the assets to be pumped. During wet years, this conveyance capacity would likely be the only capacity

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21 A project is demand-limited if there are no contractors that want any more water than they are receiving currently and if available storage facilities and/or conveyance facilities are full.

22 The Central Valley Habitat Joint Venture defined four levels of refuge water supplies: existing firm water supply (Level 1), current average annual water deliveries (Level 2), full use of existing development (Level 3), and full habitat development, by permit (Level 4). CVPIA Section 3406(d) directed the Secretary of the Interior to provide firm water through long-term contractual agreements for Level 2 refuges.

available to the EWA. The conveyance capacity would yield approximately 50,000 to 60,000 acre-feet per year, depending on operational restrictions.

2.4.3.2.4 Relaxation of the Export/Inflow Ratio

Under the SWRCB's D-1641 and Orders 2000-10 and 2001-5, Project exports are limited at certain times of the year to a percentage of Delta inflow, usually 35 or 65 percent. This limitation is called the Export/Inflow, or E/I, ratio. Both D-1641 and the 1995 Water Quality Control Plan, consistent with the 1994 Principles for Agreement (Bay-Delta Accord), allow for these ratios to be relaxed when certain requirements are met. The EWA agencies would allow relaxation of the E/I ratio as appropriate to create EWA assets in the export service areas. By relaxing the E/I ratio, it was estimated that the EWA could export an annual average of 30,000 acre-feet, but amounts are expected to vary annually.

2.4.3.3 Export Service Area

The export service areas include the areas served by the CVP and SWP Delta pumping facilities, encompassing agricultural and urban development in the Central Valley and central and southern coasts**.**

The EWA Project Agencies could acquire assets from sources within the export service areas. The EWA agencies would not need to arrange to move these assets through the Delta. This advantage is especially important during wet years, when Delta pumping capacity for the EWA is limited because the export pumps are fully utilized to move Project water. Assets purchased in the export service areas, however, are often more expensive than other assets because potential sources in the export service areas are more limited; water agencies usually are paying for facilities needed to capture and convey the limited supplies.

2.4.3.3.1 Water Acquisition Types

The EWA Project Agencies have two potential methods for acquiring water in the export service areas, crop idling and stored groundwater purchase, as described below.

<u>Crop Idling or Crop Substitution</u>

Crop idling transfers in the export service areas also involve agricultural water users leaving their fields idle and selling their surface water allotment to the EWA. Sellers in this area normally receive water CVP and SWP that is stored in San Luis Reservoir or pumped directly out of the Delta. The EWA agencies are considering purchasing water from idled cotton fields for several reasons:

- Cotton farmers have shown a willingness to sell water to the EWA;
- Cotton is less labor-intensive than other potential crops, requiring approximately 6.6 full-time labor equivalents per 1,000 acres;
- Unlike cotton, most other crops in the region are permanent crops; and

- Most other farmers in the region raise crops that produce more profit than cotton per acre and therefore would be less willing to sell to the EWA than cotton farmers because the profit from selling water would not be attractive enough to idle land.

To minimize socioeconomic effects on local areas, the EWA agencies would not purchase water via crop idling if more than 20 percent of recent harvested cotton acreage in the county would be idled through EWA or other program water acquisitions. The EWA agencies chose this figure because of historical precedents and Water Code Section 1745.05 (b).

Policy and regulatory barriers restrict crop idling in certain areas, including those areas that receive water from the SWP. The Monterey Amendment to the SWP long-term water supply contracts allow interested SWP contractors to sell some of their allocated Table A[23] amounts to a "turn-back pool" for purchase by other interested SWP contractors or DWR (or by non-contractors if DWR does not want the water). The SWP contracts do not allow contractors to sell water for use outside their service area except through the turn-back pool.

The EWA Project Agencies may purchase water through crop idling transfers from Kern County Water Agency, if these regulatory and policy barriers are removed. The EWA agencies also could purchase water through crop idling transfers from Westlands Water District and Tulare Lake Basin Water Storage District. Any of these areas could also participate in crop substitution transfers, as described in Section 2.4.2.1.3, which are included as part of crop idling transfers because they would produce similar but lesser effects.

In the export service areas, the EWA agencies would receive crop idling water at O'Neill Forebay (adjacent to San Luis Reservoir) on the same schedule that would have otherwise been employed for water user deliveries. Operations in conjunction with San Luis Reservoir would be discussed in greater detail in the Borrowed Project Water portion of Section 2.4.3.3.2, Asset Management.

Stored Groundwater Purchase

Stored Groundwater Purchases in the export service areas would function in the same way as the upstream stored groundwater purchases (Section 2.4.3.1.4), in which entities would sell water to the EWA that they had previously stored in the ground. The EWA agencies could receive this water through two mechanisms:

- The selling agency could exchange its surface water allocation with the EWA and pump stored groundwater to satisfy local needs; or

[23] Table A is a tool for apportioning available supply and cost obligations under the SWP contract. When the SWP was being planned, the amount of water projected to be available for delivery to the contractors was 4.2 million acre-feet (maf) per year. Table A lists by year and acre-feet the portion of the 4.2 maf deliverable to each contractor. The Table A amounts are not an indication of the SWP water delivery reliability, nor should these amounts be used to support an expectation that a certain amount of water would be delivered to a contractor in any particular time span.

- The selling agency could pump water out of its aquifer directly into a conveyance system for transfer to the EWA.

Stored groundwater is available to the EWA year-round, although the delivery would generally be during the irrigation season, usually April through September, if the water were delivered through surface water exchange.

The EWA Project Agencies may purchase stored groundwater from projects within Kern County. Several agencies have stored excess surface water in projects in the Kern County groundwater aquifer. Several projects in Kern County have stored groundwater that could be sold to the EWA:

- **Kern Water Bank:** water stored by a Joint Powers Authority consisting of local water agencies.

- **Pioneer Banking Project:** a coalition of local agencies recharges and recovers water. Kern County Water Agency could sell part of its 25 percent share of stored water to the EWA.

- **Berrenda Mesa Project:** Berrenda Mesa Water District owns this project in partnership with several other local agencies and could sell water if it chose to participate.

In addition, Semitropic Water Storage District and Arvin-Edison Water Storage District operate water storage facilities. These districts do not store their own water, but instead engage in agreements with outside parties. These external groups provide surface water for storage underground and pay a fee to the districts to store the water. The EWA Project Agencies could purchase water from the parties that store water in Semitropic or Arvin-Edison. Santa Clara Valley Water District has water in storage in Semitropic that it could sell to the EWA, and Metropolitan Water District of Southern California has water in Semitropic and Arvin-Edison.

Although water stored underground in the Export Service Area may be SWP water, CVP floodflows, or Kern River floodflows, the Kern groundwater storage projects have stored primarily SWP water, having anticipated that local water users would use it. As discussed earlier, the Monterey Agreements specify that unused SWP water should go to the turnback pool for other SWP contractors. The SWP water that was stored within Kern County did not first go to the turnback pool, creating regulatory concerns with selling that water to a non-SWP contractor. To help the EWA during its startup phase, Kern County Water Agency has sold water stored in 1995 through 1999, when SWP contractors received 100 percent allocations. DWR and other SWP contractors agreed to this stipulation before Kern County Water Agency sold the water to the EWA, but agreed that it would only apply to water sold to the EWA.

With current SWP policies, Kern projects would not be able to sell SWP water that was stored during the other years. Without additional water to recharge, it is likely that Kern County Water Agency would have less water available to sell to the EWA in upcoming years. This issue is discussed in greater depth in EWA EIS/EIR Chapter 6,

Groundwater Resources, which includes a discussion of the amount of stored water from each of the different sources.

If the EWA agencies acquire stored groundwater through a transfer of the selling agency's surface water allocation, the exchange would be made at O'Neill Forebay. The EWA agencies would acquire water on the same delivery schedule that the selling agency would have had without the transfer. If the selling agencies pump groundwater directly into the California Aqueduct, the seller must work cooperatively with DWR to ensure that the groundwater meets DWR's water quality requirements.

2.4.3.3.2 Asset Management

The EWA requires facilities and operational arrangements in order to make its assets available when needed for accomplishing EWA objectives. The CALFED ROD defined several tools to manage assets, including the ability to borrow project water if needed and store it for use at a time other than when the asset was acquired. Project facilities and agencies assist the EWA by conveying, storing, and loaning water when possible.

Borrowed Project Water

Borrowing Project water is a management arrangement available to the EWA agencies, as long as the borrowed water could be repaid without affecting the current or following year's allocations to project contractors. Borrowing of project water, specifically in San Luis Reservoir, is intended to enhance the effectiveness and use of EWA assets. Borrowing could take place only when the borrowed water would not exacerbate water quality and supply problems associated with the San Luis low point[24] and if the reservoir could still meet reasonable carryover storage objectives.

The EWA agencies would use borrowed project water from the San Luis Reservoir in conjunction with upstream-from-the-Delta transfers. If the Projects are unable to convey water through the Delta because of EWA pumping reductions, the EWA agencies could borrow water from San Luis Reservoir, provide it to Project Contractors during the reduction, then repay the water to the reservoir later by moving EWA assets from upstream reservoirs when the Delta pumps are running. EWA agencies may thus at times carry a debt to the San Luis Reservoir, that would affect water elevations in the reservoir.

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[24] The low point is the summertime seasonal lowest level of San Luis Reservoir. As the elevations in San Luis Reservoir approach the low point, the low point problem occurs when the volume of water in San Luis Reservoir drops to approximately 300,000 acre-feet. At 300,000 acre-feet of storage, algal blooms can cause water quality problems for urban water users that receive supplies, especially Santa Clara Valley Water District. Water quality concerns for industrial users start when the reservoir has only 300,000 acre-feet of storage, and the EWA is not allowed to cause the reservoir to reach this storage level sooner than it would without the EWA. If drawdown of the reservoir continues, CVP and SWP deliveries are no longer possible when the reservoir reaches "dead storage" at approximately 80,000 acre-feet.

Figure 2-14 illustrates a year in the San Luis Reservoir during which water is borrowed from the Projects. By borrowing water, the EWA agencies would decrease reservoir levels.

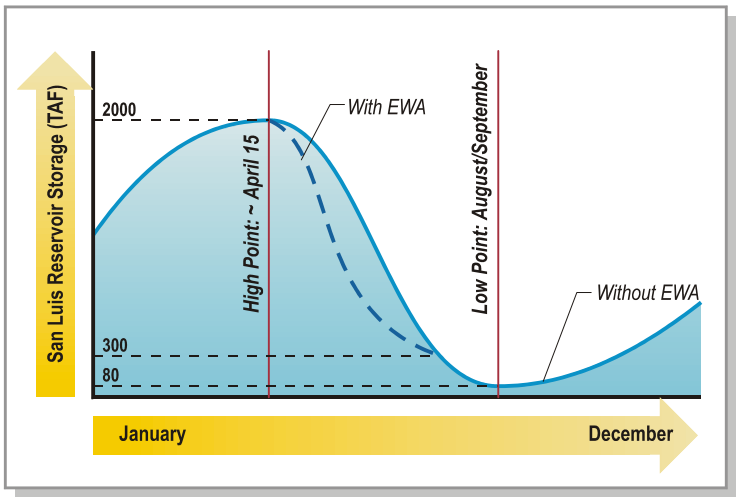

Figure 2-14
Reservoir Level Changes Due to Borrowing Water from San Luis Reservoir

In addition to borrowing project water, as described above, the EWA agencies could also borrow project storage if space were available. Some EWA assets are available at times when they cannot immediately be used for fish actions, such as the variable assets described above. The EWA agencies could store these assets in San Luis Reservoir, but they would have the lowest priority for storage (other than water stored for non-Project entities). San Luis Reservoir fills in most years, so it is likely that the water would convert to Project water and no longer be available to the EWA.[25] Additionally, the EWA could borrow Project storage in other facilities, such as Lake Shasta, Lake Oroville, and Folsom Lake. The EWA agencies would typically use this option to store water over the winter, but this water would be the first to spill from the reservoir if the reservoir reached the flood control limits.

Groundwater Storage

The CALFED ROD states that the EWA agencies should purchase 200,000 acre-feet of storage (initially full) south of the Delta to provide initial assets and to store assets that have been acquired in excess of immediate needs. Groundwater storage requires the ability to percolate or inject the excess water into a groundwater basin for later extraction, or have project water that could be transferred to the EWA as a mechanism to return the water to the EWA. Having facilities for groundwater storage of EWA assets would provide the EWA the flexibility to acquire and store water throughout the year, which would allow additional flexibility in asset acquisition.

Groundwater storage is different from the acquisition method of purchasing stored groundwater because the EWA agencies would be providing the assets to be stored (after the initial purchase of the full storage area). If the EWA agencies purchased stored groundwater, it would purchase water that the sellers had previously stored in the ground.

[25] If San Luis Reservoir would have filled without the EWA, then the EWA would not be able to keep water in storage in that reservoir. EWA water would then convert to Project water.

The groundwater storage would likely be operated with 100,000 acre-feet of flexible storage that could be exercised yearly or extracted in any one year and 100,000 acre-feet of water remaining in storage as a backup supply.

Obtaining groundwater storage involves negotiating a lease agreement with an entity that operates a groundwater banking program. The agreement would require payment for use of recharge and extraction facilities, as well as charges for occupying or reserving the storage space. Assets stored in water banks are generally charged for losses upon both recharge and extraction. If the EWA agencies acquire water banking capacity, the assets would probably be charged a small percentage of loss representing basin losses. Upon extraction, similar losses would be applied.

Stored groundwater could be returned to the EWA through two mechanisms:

- The banking entity could extract the water out of the ground and into a waterway or project conveyance facility; or
- The entity could transfer its surface water allotment to the EWA and pump groundwater for local use.

The EWA agencies have not yet acquired this groundwater storage, but have acquired additional assets to account for the lack of storage. The EWA Project Agencies may acquire groundwater storage services from Kern County Water Agency, Semitropic Water Storage District, and Arvin-Edison Water Storage District. The EWA Project Agencies could also negotiate groundwater storage services with Santa Clara Valley Water District or Metropolitan Water District of Southern California, which have water storage capacity in Semitropic and Arvin-Edison Water Storage Districts.

Source Shifting

Source shifting is a tool that was developed in the CALFED ROD to help make the EWA more flexible. With source shifting, the EWA agencies would borrow scheduled water from a project contractor for a fee, returning the water at a later date. The result of this option is to delay delivery of SWP or CVP contract water.

The purpose of implementing source shifting would be to help protect the San Luis Reservoir against reaching storage volumes where the low point problem begins earlier with the EWA than it would have without the EWA. Source shifting would allow the EWA to borrow water from one or more Project contractors and use it to repay debts to the San Luis Reservoir before the low point problem has begun. The objectives of source shifting would be to prevent San Luis from reaching the point at which it could not continue to make Project deliveries (approximately 80,000 acre-feet of storage) or at which water quality creates problems for contractors (approximately 300,000 acre-feet of storage) before it would have without the EWA.

If projections show that the EWA could cause San Luis Reservoir to reach 300,000 acre-feet of storage sooner than it would have without the EWA, then the EWA agencies would implement source shifting agreements. In some years, San Luis Reservoir storage would fall below 300,000 acre-feet without the EWA. In this

situation, the EWA agencies would not be responsible for source shifting to bring storage back up to 300,000 acre-feet, but would only need to implement source shifting to bring the storage back up to the without-EWA levels.

To participate in source shifting, contractors must have storage from which to draw while their deliveries are delayed. The EWA agencies could engage in source shifting agreements with Santa Clara Water District and Metropolitan Water District of Southern California. Santa Clara Water District would use surface water storage capacity within Anderson Reservoir. Metropolitan Water District is considering using surface water reservoirs (Diamond Valley Lake, Lake Mathews, Castaic Lake, and Perris Lake) and groundwater storage programs to participate. If source shifting were implemented in surface water storage facilities, it would cause the participating reservoir levels to fall earlier in the year than they would without the EWA, but the reservoir levels would return to levels that would occur without the EWA as the water is paid back (see Figure 2-15).

The EWA agencies could also create a source shifting agreement with Kern County Water Agency, which would use groundwater supplies during the delayed deliveries. Water from Kern County could be delivered by exchanging surface water deliveries or through direct groundwater pumping into the California aqueduct (as described in the Stored Groundwater Purchase section, above).

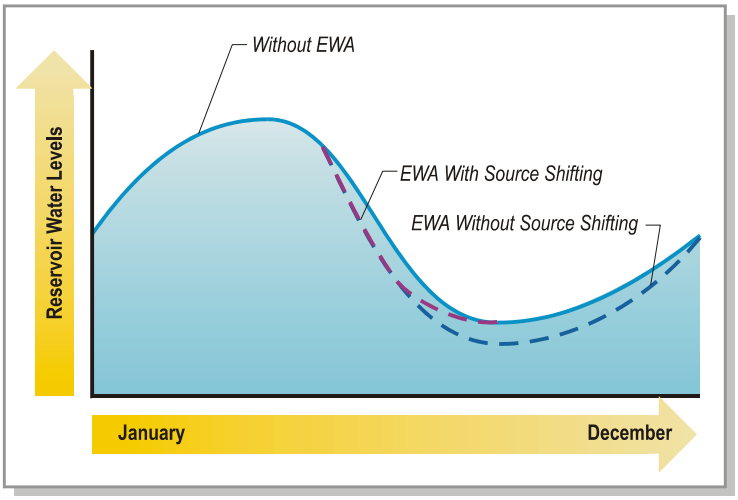

Figure 2-15
Reservoir Level Changes Due to Source Shifting

If the EWA agencies activated a source shifting agreement, the deferred surface water deliveries would be transferred to the EWA at O'Neill Forebay and could be stored in San Luis Reservoir. If the source shifting participant had a portion of its allocation stored in San Luis Reservoir, that water would be transferred to the EWA and the participant's deliveries would be reduced. After the San Luis Reservoir low point occurred, source shift water could be returned to the projects at O'Neill Forebay and then conveyed to those contractors that provided source shifting services (those that agreed to delay delivery of their contract water).

At the start of source shifting operations, water surface elevations in the reservoirs or groundwater levels would decrease relative to non-EWA conditions. The water levels would then return to non-EWA conditions as the water was paid back, which could continue into the next year. Source shifting does lower water levels temporarily, but only within existing operating parameters. The reservoirs or groundwater aquifers would not be operated outside their standard operations.

Pre-Delivery

As a permutation of source shifting, the EWA agencies could engage willing partners to receive water earlier than they would typically receive water. The EWA agencies would consider this tool if the EWA had water in storage in San Luis Reservoir during the winter that may convert to Project water as San Luis fills. To implement pre-delivery, the EWA agencies would deliver water to users in the Export Service Area that have their own storage facilities in which to store that water. The EWA would essentially be borrowing storage space from these users. This action would increase reservoir levels in surface storage facilities. The EWA Project Agencies may engage in pre-delivery with Metropolitan Water District of Southern California. In some cases, such as the Santa Clara Valley Water District's Anderson Reservoir, there may also be some risk of spill of the EWA asset that would be addressed through contract terms.

Exchanges

The EWA agencies could engage willing partners to receive water earlier than their normal delivery schedule. The EWA agencies would consider using this tool if they had remaining assets at the end of June and they did not anticipate using these assets before the end of the water year. In a dry summer period, the EWA could exchange its surplus assets with an agricultural contractor with the agreement that the contractor return the water on request in the next relatively wet year; for example, a year with SWP allocations of 70 percent or higher. The agricultural contractor would then take delivery of the EWA water from July through the end of the irrigation season instead of pumping local groundwater or drawing on other sources. The exchange would reduce groundwater pumping in the first year of the exchange, and would require the contractor to reduce dependence on contract supplies in the year of the return of the water.

Similarly, the EWA agencies could exchange surplus assets with a contractor that has available surface water storage. The contractor would take deliveries of the EWA water during the same time period instead of drawing on local surface water supplies. The exchange would result in slightly higher reservoir levels throughout the winter and until the contractor returns the water to the EWA in a relatively wet year.

Exchanges would have similar effects to other water management methods discussed in earlier sections. Exchanging water with an agricultural contractor to use in lieu of groundwater would result in the same types of effects as groundwater storage. Exchanging water with contractors that have surface water storage is similar to pre-delivery. The resource area analyses do not specifically analyze exchanges because these effects are covered as a part of the analysis of groundwater storage and pre-delivery.

2.4.4 Typical Year EWA Operations

In a typical year, the EWA would purchase 200,000-300,000 acre-feet for its annual operations. In the driest years, and when assets were carried over from the prior year, the total acquisitions could be closer to 200,000 acre-feet. In near average water years, the acquisition target would be closer to 300,000 acre-feet or even higher.

In the wetter years when operational curtailments would be expected to cost more water because the base Delta pumping rate would be higher or when the EWA ends the prior year with substantial debt, water needs for fish may be in the 400,000-600,000 acre-foot range. Initial acquisition targets may be lower in those years, and water acquisitions likely would reach the higher end of the range only if Tier 3 assets were called upon to complete the acquisition of the needed water. Tier 3 assets could be made available when Tier 2 assets were exhausted and the Management Agencies determine that jeopardy would occur due to Project operations unless additional measures were undertaken.

Table 2-7 provides an analysis of possible operational ranges of the EWA under different year types as defined by the Sacramento River Index.[26] The table is based on EWA asset acquisition priorities identified by the EWA agencies (see Section 2.4.5) and upper limits for each source category defined in Table 2-5 of this document.

Table 2-7
Estimated EWA Acquisition Patterns Keyed to SWP Allocation, Cross-Delta Capacity, and Acquisition Priorities (Values in Thousand Acre-Feet)

Year Type	*SWP Allocation*	*Purchase Target*	*Upstream from the Delta Sources*				*Export Service Area Sources*	
			Reservoir Storage	*Groundwater Substitution*	*Crop Idling*	*Groundwater Purchase*	*Groundwater Purchase*	*Crop Idling*
Critical	20-40%	200-240	75-175	25-125	0-100	0-10	0-50	0-50
Dry	35-60%	210-270	75-175	25-125	0-100	0-10	0-150	50-100
Below Normal	50-80%	230-300	75-150	25-125	0-50	0-10	50-165	50-290
Above Normal	70-90%	250-300[1]	75-150	25-50	0	0	50-165	180-340
Wet	80-100%	250-300[2]	75-150	25-50	0	0	50-165	230-490

[1] In wetter years, purchases above 300 TAF may be required, depending on fish actions. Tier 3 assets may be required.
[2] In the wettest years, purchases above 300 TAF and as high as 600 TAF may be required, depending on fish actions. Tier 3 assets may be required.

The following text describes how the EWA agencies would pursue water acquisitions as the year type unfolds. In all years, the EWA agencies would begin negotiating with willing sellers in the prior summer and fall, well in advance of knowing hydrologic conditions. In some cases, multi-year agreements, most involving options, would be in place.

The EWA agencies would negotiate options both upstream from the Delta and within the export service area to be able to maximize use of cross-Delta transfer capacity in the SWP's Banks Pumping Plant, which would be minimal in wet years, but would become more available in dry years when SWP allocations to contractors would be relatively low. Cross-Delta transfer capacity also would be influenced by the amount of water transfers originating upstream from the Delta arranged by Project

[26] The Sacramento River Index classifies water years based on the unimpaired runoff from the Sacramento River system.

contractors, DWR, and the CVP. Holding option contracts would allow the agencies to maximize the purchase of less costly Upstream-from-the-Delta water when transfer capacity was available and would allow purchase of sufficient water from the export service area in wet years with limited transfer capacity.

The EWA would lose an estimated 20 percent of the water obtained from the Sacramento River and its tributaries to carriage losses in the Delta. Water obtained from the San Joaquin River basin is subject to a 10 percent conveyance loss. Each year the carriage water loss amount would be reevaluated. However, the net cost of the water from the Upstream from the Delta water after losses would be less than assets from the export service area.

2.4.4.1 Critical Year

In the driest years, the SWP would have a low water supply allocation to its contractors, probably in the range of 20 to 40 percent of requested amounts. The EWA would have significant cross-Delta transfer capacity available and would primarily seek upstream water. Stored reservoir water would be the first priority water source, followed in sequence by groundwater substitution, stored groundwater, and crop idling (rice). The priorities among source categories would remain the same in all year types.

In sequential dry and critical years, reservoir levels may be drawn down to the point that transfers of stored reservoir water to the EWA become unlikely or highly restricted. In such times, the EWA agencies would need to increase the emphasis on transfers involving groundwater substitution, groundwater purchase, and crop idling. The EWA agencies would be less likely to pursue crop idling transfers unless reservoir levels were lower than usual early in the winter.

As shown in Table 2-7, the maximum purchase target would be greatest for stored reservoir water, then groundwater substitution, groundwater purchase, and lastly crop idling, still in potentially significant amounts if reservoir water appeared limited. Stored groundwater purchase quantities would be minimal, largely due to limited availability north of the Delta.

The total purchase quantity would be relatively low in critical years, as Delta pumping would be low and operational curtailments would be less costly in terms of the pumping foregone that must be replaced by the EWA. EWA variable asset tools, however, would likely produce less water for the EWA in drier years.

2.4.4.2 Dry Year

In a dry year, SWP allocations would likely be in the 35 to 60 percent range. Cross-Delta transfer capacity available to the EWA may begin to be constrained at the upper range of these allocations, depending on runoff timing, competing transfers, and other operational factors. The EWA purchase target would be somewhat greater than in a critical year because operational curtailments would represent a larger reduction in Delta export pumping. The EWA agencies would pursue a strategy very similar to the critical year strategy, with most assets coming from the upstream from the Delta

region. At higher SWP allocations, cross-Delta transfer capacity may become a constraint on the ability to move water from upstream when needed, and the EWA agencies may need to acquire water from the export service area as well.

As noted above, in sequential dry and critical years, reservoir levels may be drawn down to the point that transfers of stored reservoir water to the EWA would be unlikely or highly restricted. In such times, the EWA agencies would need to increase the emphasis on transfers involving groundwater substitution, groundwater purchase, and crop idling. Crop idling transfers would be less likely to be pursued unless reservoir levels were lower than usual early in the winter.

Acquisition target ranges would be about the same upstream from the Delta as for a critical year.

2.4.3.3 Below Normal Year

In a below normal year, the SWP allocation could range between from approximately 50 to 80 percent. In this range, the ability of the EWA to move water across the Delta would become more constrained, and at the higher allocations may become limited to the 500 cfs capacity dedicated to the EWA, or about 60,000 acre-feet, depending on runoff timing, competing transfers, and other operational factors. Purchase options play a key role in adjusting the locations where water would be purchased to match the cross-Delta transfer capacity as the SWP allocation would be established in the spring.

Because the water cost of operational curtailments would increase as SWP allocations and Delta pumping increase, the EWA's acquisition target would increase. Acquisitions can involve significant purchases from the upstream from the Delta region in the lower range of below normal year allocations, but at higher allocations the purchases would shift to the Export Service Area, where stored groundwater and crop idling play a major role. As previously stored groundwater is depleted by EWA purchases, the crop idling (cotton) source would become more important.

2.4.4.4 Above Normal Year

In an above normal year, the SWP allocation could range from approximately 70 to 90 percent. In this range, the ability of the EWA agencies to move water across the Delta may become limited to the 500 cfs of dedicated capacity, or about 60,000 acre-feet, depending on runoff timing and other operational factors. The EWA agencies would seek at least 75,000 acre-feet of stored reservoir water north of the Delta, exporting 60,000 acre-feet and providing an estimated 15,000 acre-feet (20 percent) for carriage water. If additional transfer capacity were available in that year, the EWA would seek additional water from stored reservoir supplies and groundwater substitution sources to fill the available capacity.

Water costs in some above normal years could exceed 300,000 acre-feet, possibly requiring Tier 3 purchases.

The water needed to cover operational curtailments at the Delta pumps would increase further in an above normal year, and the EWA's acquisition target would increase. The balance of needed assets would be obtained from banked groundwater and crop idling south of the Delta.

2.4.4.5 Wet Year

In the wet years, the SWP allocation would likely be at least 80 percent and in some years 100 percent. The cost of operational curtailments could become greater, especially if the wet hydrology brings fish into the vicinity of the pumps more often. Water costs in the wet years, possibly including Tier 3 purchases, could reach the upper limit selected for the Proposed Action, 600,000 acre-feet.

In the wet years, the ability of the EWA agencies to move water across the Delta may become limited to its 500 cfs dedicated capacity, or about 60,000 acre-feet. The EWA agencies would seek at least 75,000 acre-feet of stored reservoir water from the upstream from the Delta region, exporting 60,000 acre-feet and providing an estimated 15,000 acre-feet (20%) for carriage water. If additional transfer capacity were available in that year, the EWA would seek additional water from stored reservoir supplies and groundwater substitution sources to fill the available capacity.

The balance of needed water would have to be sought from the export service area, through a substantial amount of crop idling and some stored groundwater. Some of the crop idling may have to be arranged after initial planting, when the consequences of the wet hydrology and fish behavior become more completely known. Only when it is necessary to purchase Tier 3 assets would the EWA agencies actually acquire the maximum quantity of water identified in the as part of the Proposed Action.

2.4.5 Acquisition Strategy

The EWA agencies would acquire water using an acquisition strategy that meets multiple goals and objectives when acquiring water. These goals include:

- Acquire water at a unit cost that is most effective considering the benefits achieved;
- Protect assets by creating arrangements to carry over water between years;
- Continue coordination with other water purchase programs;
- Maximize the existing and future funding opportunities; and
- Improve flexibility by:
    - Expanding the types of purchases and the number of potential sellers;
    - Developing actions that continue for more than 1 year.

The sections below describe several components of the strategy that are relevant to assessing the environmental effects of the Proposed Action.

2.4.5.1 Tie Water Purchases to Hydrologic Conditions to Minimize Costs

The amount of water available for transfer is typically greater in areas upstream from the Delta than in the export service areas because more than 70 percent of runoff comes from northern California (DWR 1998). This difference is reflected in the market rates received by willing sellers in these two areas. The differences in water prices upstream from the Delta and the export service areas are greater than simply the costs of transporting water across the Delta. The differences reflect a structural difference in the water economies of these two areas.

Water from the areas upstream from the Delta is less expensive, but the EWA has limited conveyance capacity to convey water across the Delta in some hydrologic conditions. Therefore, the EWA would pursue a strategy in which it maximizes purchases from areas that are upstream from the Delta to the extent that it can convey water across the Delta.

Some water purchases in areas upstream from the Delta are generally less expensive, have fewer environmental effects, and are more flexible; therefore, the EWA Project Agencies would prioritize these types of acquisitions for purchase. The highest priority would be stored reservoir purchase, followed by groundwater substitution and stored groundwater purchase. The lowest priority would be crop idling transfers because of their increased environmental effects and decreased flexibility. In some cases (e.g. Sacramento River area idling transfers), the foregone consumptive use in April, May, and parts of June may not be effectively captured and exported by the EWA because the water must be released to meet downstream requirements, yet it cannot be pumped in the Delta.

Acquisitions in the export service area generally follow the same pattern: stored groundwater purchase is less expensive, more flexible, and has fewer environmental effects than crop idling transfers. Unfortunately, potential supplies in the export service areas are decreasing, and may not be available into the future. For purchases from the export service area, the EWA Project Agencies would prioritize stored groundwater purchases if available.

2.4.5.2 Continued Coordination with other Acquisition Programs

Other water acquisition programs would also acquire water in the same regions as the EWA, and some programs would seek to use this water to achieve similar goals. Coordination of the programs would critical to help maximize environmental benefits of these programs and avoid cumulative effects.

2.4.5.3 Set Water Purchase Targets

With a high upper limit on the purchases for the Proposed Action, the EWA would try to set water purchase targets based on Management Agencies' predictions of fish needs for different year types. Setting these purchase targets before the EWA Project Agencies negotiate acquisitions would help in purchasing enough assets to meet fish needs.

2.4.5.4 Aggressively Use Purchase Options

DWR could negotiate purchase options, in which they secure a contractual ability to call upon water to be transferred at a future date. Aggressive use of options upstream from the Delta would provide the EWA agencies flexibility to deal with changing hydrologic conditions. One concern related to options is that in many cases the call dates[27] needed by the sellers occur early in the year, before much is known about the hydrologic conditions. The EWA would seek option call dates as late into the year as possible, consistent with the needs of the sellers.

2.4.5.5 Increase Use of Multi-Year Transfers

The EWA Project Agencies could negotiate longer-term contracts with willing sellers to acquire water from the same source in multiple years. Multi-year agreements would likely decrease the cost of the water and improve flexibility by having a source that is available without additional negotiations.

2.4.6 EWA Action Effects Monitoring and Adaptive Management

The EWA agencies would implement a multifaceted monitoring program to assess the benefits and effects of EWA asset acquisition and management actions. A portion of the monitoring program would draw upon the findings of ongoing fish monitoring efforts being performed in the Delta, at the Delta pumps, Sacramento River, San Joaquin River, and tributaries. Another portion of the monitoring program would be the development of new monitoring efforts for locations where monitoring is now not occurring. The existing CALFED science review processes would continue the current evaluation of all efforts related to fish population recovery in the CALFED focus area. The data collected and reviewed through these processes would be used in an adaptive management process to suggest changes in relation to the acquisition and management of EWA assets.

Regarding terrestrial wildlife and vegetation, the EWA agencies would update species distribution maps, as introduced in Chapter 3 of the ASIP, to focus and avoid areas for rice farmland idling. The idling of rice farmland has been determined in this ASIP to be the only EWA asset acquisition and management action with potential adverse effects to terrestrial species. As part of the water acquisition and implementation strategy, the Project and Management Agencies would monitor in the field rice farmland idling patterns in relation to core wildlife areas and ensure that the conservation measures, presented in Section 2.5, are adhered to by the willing sellers.

Chapter 7 of this ASIP provides details regarding the EWA monitoring and adaptive management programs.

2.5 Conservation Measures

The CALFED MSCS, the document from which the EWA ASIP tiers, presents the basis for conservation measures developed to address CALFED actions overall, as outlined

[27] The "call date" is the last date that the EWA could call for the water.

in the Programmatic CALFED EIS/EIR. The CALFED MSCS follows the two-tiered approach to FESA, CESA, and NCCPA compliance initiated by the CALFED Programmatic EIS/EIR and MSCS. The MSCS provides the CALFED programmatic compliance with FESA, CESA, and NCCP while this EWA ASIP provides the project-level compliance with these acts. As such, this ASIP represents the project-level biological assessment for initiating consultation with USFWS and NOAA-Fisheries under the Section 7 of the FESA and the project-level NCCPA compliance.

Many of the conservation measures introduced in the MSCS address CALFED construction and habitat improvement/conversion projects that are not components of the EWA Proposed Action. The MSCS does introduce EWA actions at the programmatic level and water transfers at a policy level. As such, the majority of the MSCS conservation measures are either too specific to other CALFED actions or too general to address specific EWA actions. The principles and expected outcomes of the MSCS conservation measures were used by a multiple agency team of biologists in the process of modifying the MSCS conservation measures to address (reduce or eliminate the effects) of EWA actions or in the development of new conservation measures not addressed in the MSCS. Included in the development of the EWA conservations measures was the assessment of the trade-offs between additional water for fish actions and water that could be used to support other environmental projects.

This section presents the EWA conservation measures developed to avoid, minimize, and compensate for effects on special-status species and NCCP communities. Included are the conservation principles the EWA measures are based on, the conservation strategy driving the development of the EWA measures, and the conservation measures put forth in this ASIP as a part of the EWA program.

2.5.1 Conservation Principles

Four documents were reviewed for principles that assure protection and improvement of species at the highest benefit based on EWA water asset and management actions. These documents are: the MSCS; CALFED Programmatic Biological Opinions and NCCP; the 1995 USFWS biological opinion for CVP/SWP operation effects on Delta smelt; and the 1993 NOAA Fisheries biological opinion for CVP/SWP operation effects on Sacramento River winter-run Chinook salmon ESU.

The Federal Endangered Species Act of 1973 as amended provides the general conservation principles used to develop conservation measures for EWA actions.

According to the ESA, conservation is "the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and trans- plantation, and, in the extraordinary case where population pressures within a given ecosystem

cannot be otherwise relieved, may include regulated taking (Endangered Species Act 1973)."

The NCCP General Process Guidelines delineate the scientifically sound principles of conservation biology used in formulating those provisions of the plan to protect, restore, or enhance the ecosystems, natural communities and habitat types within the plan area. Accepted and demonstrated principles of conservation biology for species covered have been used in formulating EWA conservation measures.

2.5.2 Conservation Strategy and Conservation Measures

The CALFED program, in particular the ERP, was developed to function as a comprehensive, long-term plan that will restore ecological health to the Bay-Delta system and improve management of water for beneficial uses. The ERP, the Strategic Plan for Ecosystem Restoration, and the MSCS were the primary documents used by CAFED agencies to outline the conservation strategy of the CALFED program with regards to species and natural communities.

The EWA Proposed Action has been developed to contribute to the recovery of at-risk native fish species inhabiting or migrating through the Bay-Delta. Therefore, the EWA actions stated in the Proposed Action description reflect an important strategy for the recovery of at-risk native fish species. For all other species potentially affected by EWA actions, the EWA conservation strategy is to avoid or minimize effects on species and natural communities. Any contributions to recovery will be incidental. The conservation measures provided in Section 2.5.3 will avoid or minimize the potential effects discussed in Chapters 4 and 6.

The MSCS contains a list of conservation goals for each species and NCCP community evaluated in the MSCS. The three alternative goals for species are recovery ("R"), contribute to recovery ("r"), and maintain ("m"). The goal of "recovery" was assigned to those species whose recovery is dependent on restoration of the Delta and Suisan Bay/Marsh ecosystems and for which CALFED could reasonably be expected to undertake all or most of the actions necessary to recover the species. Recovery is achieved when the decline of a species is arrested or reversed, threats to the species are neutralized, and the species long-term survival in nature is assured.

The goal "contribute to recovery" was assigned to species for which CALFED actions affect only a limited portion of the species range and/or have limited effects on the species. To achieve the goal of contributing to a species recovery, CALFED is expected to undertake some of the actions under its control and within its scope that are necessary to recover the species. When a species has a recovery plan, CALFED may implement both plan measures that are within the CALFED Solution Area and some measures that are outside the Solution Area. For species without a recovery plan, CALFED will need to implement specific measures that will benefit the species.

The goal "maintain" was assigned to species expected to be affected minimally by CALFED actions. For this category, CALFED will avoid, minimize, and compensate for any adverse effects to the species commensurate with the level of effect on the species. Actions may not actually contribute to the recovery of the species; however,

at a minimum, they will be expected to not contribute to the need to list the species or degrade the status of a listed species. CALFED also will, to the extent practicable, improve habitat conditions for these species. These goals can be found in the species accounts in Chapter 3.

The CALFED Ecosystem Restoration Program (ERP) has adopted the CALFED MSCS goals related addressing "recovery", "contribute to recovery", and "maintain" for MSCS covered species as described above. The ERP has also adopted the MSCS conservation measures and would build upon those measures during the process of completing ERP studies and actions. The ERP's focus is on measures to enhance NCCP communities and the ERP has a goal related to the need to "enhance and/or conserve biotic communities" ("E"). A final ERP goal is to "maintain and/or enhance harvested species" ("H"), which relates to commercial/recreational use of native and non-native biological resources.

2.5.3 EWA Conservation Measures

Conservation measures that would be applied to the EWA actions for each species and NCCP habitat are described in this section. The cost of any conservation measures or additional environmental measures for EWA actions would be paid for from those funds identified for implementation of EWA.

2.5.3.1 General Conservation Measures

The conservation measures presented in this section apply to all species and NCCP habitats in general.

Conservation Measure Applicable to all Species

The EWA Project agencies will coordinate EWA water acquisition and transfer actions with Federal (Reclamation, USFWS and NOAA Fisheries), State (DWR and CDFG), other CALFED agencies, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, the Senate Bill [SB] 1086 program, the U.S. Army Corps of Engineers' [USACE's] Sacramento and San Joaquin Basin Comprehensive Study, the Riparian Habitat Joint Venture, the CVPIA, the Central Valley Habitat Joint Venture, and the Grassland Bird Conservation Plan) that could affect management of evaluated species. Coordination will avoid conflicts among management objectives and will be facilitated through CALFED's water transfer program.

General Fish Species Conservation Measures

- In implementing the EWA, the EWA agencies will avoid acquisition and transfer of water that will reduce flows essential to maintaining populations of native aquatic species in the source river.

- In implementing the EWA water acquisition and transfers, the EWA agencies will not increase exports during times of the year when anadromous and estuarine fish are most vulnerable to damage or loss at project facilities or when their habitat may be adversely affected.

- In implementing the EWA, the EWA agencies will avoid acquisition and transfer of stored reservoir water quantities that will impair compliance with flow requirements and maintenance of suitable habitat conditions in the source river in subsequent years.

2.5.3.2 Federal Threatened or Endangered Species – Fish Species

Delta Smelt (T-FESA; T-CESA)

- In implementing the EWA, the EWA agencies will fully adhere to the terms and conditions in all applicable CESA and FESA biological opinions and permits for CVP and SWP operations.

- In implementing the EWA, the Project Agencies will not initiate EWA water exports in July until Management Agencies agree that Delta smelt will not be harmed.

Salmonids – General Conservation Measures - Central Valley Fall/Late-Fall Run Chinook Salmon (C-FESA; SSC-CDFG); Sacramento River Winter Run Chinook Salmon (E-FESA; E-CESA); Central Valley Spring Run Chinook Salmon (T-FESA; CT-CESA); Central Valley Steelhead (T-FESA)

- In implementing the EWA, the EWA agencies will fully adhere to the terms and conditions in all applicable CESA and FESA biological opinions and permits for CVP and SWP operations.

- In implementing the EWA, the EWA agencies will minimize flow fluctuations resulting from the release of EWA assets from project reservoirs to reduce or avoid stranding of juveniles.

- The EWA agencies will consult with the local river management teams regarding management of EWA water on those rivers.

Central Valley Fall/Late-Fall Run Chinook Salmon (C-FESA; SSC-CDFG)

- In May, the EWA agencies will evaluate Folsom Reservoir coldwater pool availability to benefit returning adult fall-run Chinook salmon prior to releasing EWA assets.

Central Valley Steelhead (T-FESA)

- In May, the EWA agencies will evaluate Folsom Reservoir coldwater pool availability to benefit over-summering juvenile steelhead prior to releasing EWA assets.

- In implementing the EWA, EWA agencies will consult with the local river management team regarding ramping considerations before and after EWA transfers to avoid downstream movement of juvenile steelhead.

2.5.3.3 Federal Threatened or Endangered Species – Terrestrial Species

Giant Garter Snake (T-FESA; T-CESA)

Within the Sacramento River valley, the giant garter snake (GGS) is highly dependent on rice fields and associated irrigation ditches. EWA actions, or cumulatively, water

acquisitions, could idle up to 20 percent of flooded rice fields in each county. The following text provides the proposed approach and conservation measures to protect the GGS.

As part of the EWA consultation, the USFWS will give programmatic approval to crop idling, followed by a site-specific consultation process to ensure consistency with the programmatic approval. The programmatic consultation will include three main elements: 1) the process by which site-specific agreements will be attained; 2) the list of conservation measures (avoidance, minimization, and conservation measures) which would be used wholly or in part to minimize effects of water transfers involving fallowing or crop-shifting; and 3) a description of GGS conservation strategy in Chapter 4 of this ASIP.

USFWS EWA consultation with the Project Agencies will outline a year-by-year "site specific" process to address crop idling impacts to GGS and will put boundaries on upper limit on the amount of crop idling that may occur in any given year, considering the existing 20 percent limit. Additional measures to those presented in this EIS/EIR may be incorporated as a part of consultation based on site-specific conditions.

Each year, once it has been determined that crop idling will occur, the EWA Project Agencies will contact USFWS staff to begin informal consultation and will put together a package describing where the idling activities will take place and what proposed minimization measures will be followed. This package will include maps of the proposed idled fields. USFWS will work with the EWA Project Agencies to determine if minimization measures proposed are sufficient and if additional compensatory habitat is required.

The EWA agencies will ensure through contract terms or other requirements that the following conservation measures will be implemented:

- The EWA agencies will ensure parcels from which water is to be acquired are outside of mapped proscribed areas (see ASIP Figure 3-11), which include:

- *Refuges* – Land adjacent and within 1 mile of Sacramento, Delevan, Colusa, Sutter, and Butte Sink National Wildlife Refuge (NWR), and the Llano Seco Unit of the Sacramento River NWR, Gray Lodge Wildlife Area (WA), Upper Butte Basin WA, Yolo Bypass WA, and Gilsizer Slough CE;

- *Corridors Between Refuges* – Lands adjacent to Hunters and Logan Creeks between Sacramento River NWR and Delevan NWR; Colusa Basin Drainange Canal between Delevan NWR and Colusa NWR; Little Butte Creek between Llano Seco units of Sacramento River NWR and Upper Butte Basin WA, and Howards Slough Unit of the Upper Butte Basin WA, Butte Creek Upper Butte Basin WA, and Gray Lodge WA;

- *Waterways Serving as Corridors* – Land adjacent to Butte Creek, Colusa Basin Drainage Canal, Gilsizer Slough, land side toe drain along east side of the Sutter

Bypass, Willow Slough and Willow Slough Bypass in Yolo County, North Drainage Canal and East Drainage Canal in Natomas Basin

- *Other Core Areas* – East of SR99 and between Sutter-Sacramento County line and Elverta Road in Natomas Basin, Yolo County east of Highway 113;

- The water seller will ensure that water is maintained in irrigation and drainage canals to provide movement corridors;

- The water agency will ensure that the block size of idled rice parcels will be limited to 160 acres (includes rice fields shifting to another crop);

- The water agency will ensure that mowing along irrigation and drainage canals will be minimized and mowers will be elevated to at least 6 inches above the ground level;

- The water agency will ensure that, if canal maintenance such as dredging is required, vegetation will be maintained on at least one side; and

- The EWA agencies will maximize geographic dispersal of idled lands.

GGS conservation measures may include the following, as appropriate:

- The EWA agencies will avoid purchasing water from the same field for more than two consecutive years;

- The EWA agencies will recommend that sellers replace culverts already planned for repair or replacement with oversized culverts to facilitate better wildlife dispersal;

- The EWA agencies will recommend that sellers replace water control structures with those requiring less maintenance and less frequent replacement in order to minimize maintenance impacts (steel or wooden control boxes with pre-poured concrete boxes); and

- The water agencies may fund research or surveys.

2.5.3.4 State Special Status Species

Greater Sandhill Crane (T/FP-CESA)
Crop idling of seasonally flooded agricultural land could reduce the amount of over winter forage for migratory birds.

- Avoid or minimize actions near known wintering areas in the Butte Sink (from Chico in the north to the Sutter Buttes, and from Sacramento River in the west to Highway 99) that could adversely affect foraging and roosting habitat.

Black Tern (SSC-CDFG)
Crop idling of seasonally flooded agricultural land could reduce the amount of nesting and forage habitat during the summer rearing season.

- As part of the review process for the identification of areas acceptable for crop idling, the Management Agencies will review current species distribution/occurrence information from the Natural Diversity Database and other sources (including rookeries, breeding colonies, and concentration areas). The Management Agencies will then use the information to make decisions that will avoid EWA crop idling actions that could result in the substantial loss or degradation of suitable habitat in areas that support core populations of evaluated species that are essential to maintaining the viability and distribution of evaluated species.

- As part of contractual agreements, the willing seller will be required to maintain quantities of water in agriculture return flow ditches that maintains existing wetland habitat providing habitat to the covered species.

Western Pond Turtle (SSC-CDFG)
Ditches and drains associated with rice fields provide suitable habitat for the western pond turtle. The following conservation measures will ensure effects of crop idling actions on western pond turtle habitat are avoided or minimized.

- The willing seller will be required to maintain water levels in irrigation and drainage canals to within 6 inches of non-program conditions and do not completely dry out canals.

2.5.3.5 NCCP Communities

Non-tidal Freshwater Permanent Emergent, Natural Seasonal Wetland, and Valley/Foothill Riparian Communities
Natural and Managed Seasonal Wetlands and Riparian Communities often depend on surface water-groundwater interactions for part or all of their water supply. The following conservation measures will ensure effects on these communities from groundwater substitution actions are avoided or minimized.

- A *Well Adequacy Review*. Before groundwater substitution actions are initiated the hydrogeologic conditions of wells used to transfer EWA water will be examined to minimize the potential risk of depleting surface water sources and adversely affecting associated vegetation; and

- A *Monitoring Program*. The Project Agencies will implement a monitoring program that will provide data to determine if direct or indirect effects exist.

Valley/Foothill Riparian and Montane Riparian Communities
Riparian plant germination, establishment, growth, and distribution are driven by water availability and floodplain and channel geomorphology that conform to historical patterns. The following conservation measure will ensure effects on these communities will be avoided or minimized.

- The EWA agencies will implement a monitoring program, in cooperation with other programs, that will provide flow data and observations of habitat changes to determine if changes in flows are having a direct or indirect effect on riparian

communities, particularly establishment of seedlings and survival of middle age classes.

Managed Seasonal Wetlands
Landowners with managed seasonal wetland communities often depend upon agricultural return flows for part or all of their water supply. The following conservation measure will ensure effects on this wetland community will be avoided or minimized.

- As a part of the contractual agreements, the EWA agencies will require the willing seller of water for crop idling to maintain their drainage systems at a water level that will maintain existing wetlands providing habitat to covered species. As part of monitoring program to ensure compliance with the contractual requirements, EWA agencies will periodically verify that the seller is adhering to the agreement and that no effects are occurring.

Seasonally Flooded Agricultural Lands
Conservation measures for seasonally flooded agricultural lands are provided for the giant garter snake. The primary measures applicable to seasonally flooded agricultural lands include limiting the size of idled land blocks to less than 160 acres, maintaining ditch habitat and ditch water flows, and not idling the same field more than 2 years in a row.

Anadromous Fish Community
Conservation measures for the anadromous fish community are presented in Section 2.5.3.2 for the salmonid fish species.

Estuarine Fish Species Community
Conservation measures for the estuarine fish community are presented in Section 2.5.3.2 for the delta smelt.